Paying for Performance: The Impact of Incentives to Workers' Compensation Managed Care Organizations on Claim Duration

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Abstract

Workers' Compensation (WC) employer costs are a pressing concern for states. States have tried to curb these employer costs by introducing WC Managed Care Organizations (WC MCOs). These organizations provide case management services by advocating aggressive medical treatment and facilitating return to work. In Ohio, WC MCOs receive substantial compensation from the state if injured workers return to work quickly. These incentives were put in place in the late 1990s and apply to roughly 90 percent of claims. In this paper, I examine the impact of the return-to-work incentives granted to WC MCOs on the distribution of claim duration using administrative claims data from the state of Ohio for injuries occurring between 1995 and 2004. As a result of the incentive structure, I expect the incentive to have heterogeneous effects across the distribution of claim duration with the biggest impact on the longest claims, and my empirical results confirm this hypothesis. Using quantile regression techniques and accounting for censored observations, I find the incentives induce WC MCOs to reduce claim duration in the top half of the distribution.

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1. Introduction

Workers' Compensation (WC) insurance provides medical care and cash benefits to employees who are injured at work or contract a work-related illness. Most employers are mandated to cover their workers with WC insurance, making employer costs a pressing concern for states. Politicians worry that high employer costs will discourage businesses from locating in the state, and some anecdotal evidence supports their fears.[1] In 2004, WC employer costs totaled $87.4 billion (NASI). Most recently, soaring WC employer costs in California gained national attention and were a central part of the 2003 recall election.[2] As governor of Ohio, Senator George Voinovich christened WC the "silent killer of jobs" in his 1993 State of the State speech following six years of dramatic increases in employer costs.[3]

States have attempted to curb employer costs by passing legislation which makes it more difficult for claims to be awarded compensation, rewarding the employers which implement programs promoting safety or drug-free workplaces, and introducing WC Managed Care Organizations (WC MCOs). Each of these proposes to reduce employer costs by decreasing claim duration. Large employers are experience rated, so if claims are shorter, employer experience ratings will improve and employer costs will fall.[4] The literature has found little or no effect of the policies which discourage claiming on claim duration (Ruser, Pergamit, and Krishnamurty, 2004) and the bonus payments for implementing safety or drug-free workplace programs are small in magnitude

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[1] Morris, Regan. "In California, Workers' Compensation Is a Growing Burden." *The New York Times*. September 9, 2004. C1. Russell, John. "Ohio Workers' Compensation Bureau Says Costs to Employers Are Declining." *Akron Beacon Journal*. June 24, 1999. Steel, Suzanne. "Workers' Comp Rates Still Big Problem for the Meatpacking Industry in Ohio." *The Columbus Dispatch*. April 12, 1994. 2F. Treaster, Joseph B. "Cost of Insurance for Work Injuries Soars Across U.S." *The New York Times*. June 23, 2003. A6.

[2] Murphy, Dean E. "Schwarzenegger Promises Better Times for California." *The New York Times*. January 7, 2004. A1.

[3] Lane, Mary Beth. "Voinovich Sets Sights on Reforms; Head Start, Education Changes Promised in State of State Speech." *Plain Dealer*. January 27, 1993. 1A. St. Clair, Duane. "Workers' Compensation Rates Increase an Average of 8.2%." *The Columbus Dispatch*. July 1, 1992. 1F.

[4] Experience rating is how insurance companies consider an insured's loss history when setting rates. Workplaces with safer histories pay lower premiums if they are experience rated. For example, personal auto insurance is experience rated. Drivers who are at fault for accidents pay higher premiums than they would if they did not cause the accident.

and predicted to have a modest effect. In this paper, I focus on the impact of return-to-work incentives to WC MCOs on claim duration.

The organizations proliferated, and by the end of the 1990s WC MCOs were in place in every state. Despite their popularity, there are no conclusive results quantifying their effectiveness. In Ohio, state officials laud the WC MCOs for reducing time away from work, but a recent investigative report by the Cleveland *Plain Dealer* suggests the organizations are ineffective and actually cost the state $1.6 billion.[5] To assess the impact of the organizations on employer costs, it is important to control for other completing explanations such as the national trend toward safer workplaces and workers being employed in safer industries.[6] In this paper, I will be able to control for these other trends and assess the impact of return-to-work incentives to Ohio WC MCOs on claim duration.

I have acquired administrative claims data from the state of Ohio that will allow me to examine the impact of WC MCOs on claim duration. In Ohio, WC MCOs were mandated by the state in 1993 and implemented in 1997. During this period, the organizations assumed responsibility for case management, a role previously filled by the state. In 1999, the state began to incorporate incentives into WC MCO compensation to reward the organization if injured workers return to the job quickly. These return-to-work incentives only apply to 266 of the over 1,000 five digit ICD-9 diagnosis codes, roughly 90 percent of lost time claims.[7] Profit maximizing WC MCOs focus efforts on those claims which count toward the incentive, and the claims not counting toward the incentive form a comparison group. I will be able to quantify the impact of the incentive on return-to-work outcomes by analyzing these two policy changes. I will compare outcomes for workers whose

[5] Ballantyne, 2001. Paynter, Bob. "'Reform' costs Ohio $1.6 billion." *The Plain Dealer*. September 8, 2006.
[6] Krueger, Alan. "Fewer workplace injuries and illnesses are adding to economic strength." *The New York Times*. September 14, 2000. C2.
[7] Injured workers are eligible for lost time benefits after being away from work for at least one week. Lost time claims comprise 22% of claims and 94% of costs. (Sengupta et al., 2006)

injuries count toward the incentive with outcomes for workers whose injuries do not. I expect the 1997 policy change, the introduction of the WC MCOs without the incentive, to impact the two groups equally, providing a specification test. I expect the 1999 policy change, the implementation of the return-to-work incentive, to induce a larger decline in the duration of treatment group injuries relative to the comparison group.

Using censored regression, I find the incentive decreases claim duration by over seven percent relative to the period before the WC MCOs were implemented. The structure of the incentive suggests WC MCOs will focus efforts on those claims in the top half of the claim duration distribution. I use quantile regression techniques to quantify these heterogeneous impacts across the distribution of claim duration and account for censored observations using Censored Least Absolute Deviations (CLAD). I find the incentive induced WC MCOs to reduce claim duration in the top half of the distribution of claim duration.

2. Workers' Compensation, Managed Care Organizations, and the Incentive Payment

2.1 Overview of Workers' Compensation

Workers' Compensation insurance provides medical care and cash benefits to employees who are injured at work or contract a work-related illness. The insurance pays for all medical care for the work-related injury or illness and cash benefits to replace lost earnings for workers whose injuries keep them away from work for more than one week.[8] Workers' Compensation is one of the largest social insurance programs in the United States. In 2004, individuals received a total of $56.0 billion in cash and medical payments from WC—$29.9 billion in cash benefits and $26.1 billion in medical

[8] In Ohio, workers must be out of work for more than seven days to receive cash benefits. Workers generally receive Temporary Total Disability (TTD) benefits. This waiting period varies across states. About half of all states have a waiting period of three days, 21 states have a waiting period of seven days, and five states have a 5 day waiting period. (U.S. Chamber of Commerce, 2002)

care.[9] Spending on cash benefits for WC in 2001 exceeded federal spending on Unemployment Insurance, Food Stamps, and Temporary Assistance for Needy Families.[10] Most employers are mandated to cover their workers with WC insurance.[11]

In Ohio, WC is offered in two ways. Any employer can acquire coverage through the state fund and self-insurance is available to employers with at least 500 employees. Most Ohio employers purchase WC insurance through the state fund.[12] In most other states, private insurance is the dominant choice for WC coverage. Nationally, about half of all WC benefits are paid through private insurers, 20 percent through state funds, and the remainder through self-insurance.[13]

In 2004, the Ohio state fund collected $2.2 billion in premiums and paid $870 million in medical and $1.0 billion in cash benefits.[14] Workers' Compensation MCOs earned about eight percent of premiums, nearly $174 million. An employer's premium payment is a function of the employee industry-occupation mix and loss history. The state sets base premium rates for 500 industry-occupation classifications, and large or particularly dangerous employers are experience rated. For example, the 2006 premium rate for home health aides was $6.29 per $100 of payroll, and employers with poor loss history might pay more and those with a stellar loss history might pay less.[15] In my sample, over 40 percent of employers are large enough to be experience rated.

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[9] NASI, 2004.
[10] In 2001, spending on WC cash benefits totaled $27.4 billion whereas federal spending for Unemployment Insurance totaled $24.8 billion, Food Stamps ($16.7 billion), and basic state block grants for Temporary Assistance for Needy Families, $16.5 billion. Green Book, 2004.
[11] Some examples of exempt employers include some agriculture jobs, sole proprietorships, and employers with fewer than three employees. In Texas, employers can choose to opt out of WC and instead be subject to the tort system. States mandate WC coverage in order to provide a guaranteed benefit to injured workers and protect employers from uncertain losses. Before states mandated WC, workers injured on the job would sue employers. This resulted in uncertain losses to employers—often driving them out of business—and uncertain benefits to injured workers—often with long delays between the injury and compensation (Fortson, 2006).
[12] In 2004, 1,104 Ohio employers were self-insured. The remaining 287,605 employers were insured through the state fund. (OH BWC 2004 Annual Report)
[13] Four other states (ND, WA, WV, and WY) provide WC in arrangements similar to OH—state fund and self-insurance. (Sengupta et al., 2006)
[14] OH BWC Annual Report 2004.
[15] OH BWC Manual

Workers qualify for WC medical benefits for any injury or illness that arises out of the workday. The medical benefits cover the medical care for the injury or illness. Once workers are out of work for eight days, they can begin to receive cash benefits to replace lost wages. The injured workers' benefits are a function of their weekly earnings. The benefit schedule is uniform across workers, and the same schedule also applies to injured workers whose employer is self-insured. In general, WC cash benefits replace between two-thirds and three-quarters of pre-injury weekly earnings, subject to a maximum of $704 per week in 2006, as shown in Figure 1.[16] A worker earning $600 per week before becoming injured would receive $432 in cash benefits per week.

2.2 Workers' Compensation Managed Care Organizations

In this paper, I examine two policy changes as illustrated in Figure 2. The first policy change I examine is the introduction of WC MCOs. In this section I will provide a general overview of the organizations and describe how they function in Ohio.

Workers' Compensation MCOs are different than Health Maintenance Organizations (HMOs). Although both organizations share the goal of ensuring appropriate medical care while minimizing costs, in practice the two organizations appear to function quite differently because they face different costs. Workers' Compensation MCOs minimize medical costs as well as cash benefits whereas HMOs only face medical costs. These two types of organizations will treat the same injury differently because WC MCOs must also minimize cash benefits. For example, consider a worker with a back injury. A HMO would prescribe bed rest and minimal medical treatment for a back injury. In contrast, a WC MCO would advocate aggressive medical treatment to heal the worker more quickly and expedite return to work. (Peele and Tollerud, 2001)

[16] Ohio Bureau of Workers' Compensation. In Ohio, workers are awarded 72 percent of their pre-injury weekly earnings for their first twelve weeks away from work and two thirds of pre-injury weekly earnings for subsequent weeks.

It is difficult to characterize WC MCOs because the role differs so dramatically across states. For this reason, I will illustrate how the organizations function in Ohio by following a claim from injury to return-to-work, as shown in Figure 3. When workers are injured, they first inform their employer. They are given an insurance identification card for the employer's WC MCO. The injured workers receive care from the doctors of their choice. The doctor assesses whether or not the injury is work related, makes a diagnosis, and reports the claim to the WC MCO.[17] Shortly thereafter, the WC MCO files the claim with the state and a nurse case manager contacts the doctor, the employer, and the injured worker. The nurse case manager contacts the doctor to approve the procedures requested for the claimant, advocate an aggressive approach to treatment, and encourage the doctor to release the worker to light duty, if appropriate. In fact, several WC MCO representatives referred to this as a "sports medicine" approach—intensive medical treatment that will enable the injured workers to return to work as soon as possible.

At each medical appointment for a work related injury, the doctor fills out a form identifying which activities the claimant is released to do on the job. For example, a nurse's aide who suffers a back injury might be released to do seated work, not lifting more than ten pounds. Using this form, the WC MCO helps the employer think of ways to accommodate the injured worker on the job. In the nurse's aide example, perhaps the employer will task the injured worker with folding towels or performing clerical duties. Since the claimant is able to complete modified work tasks, the worker is no longer considered totally disabled and is ineligible to receive cash benefits. In the absence of WC MCOs, an employer could advocate for aggressive medical treatment and accommodate injured

[17] In Ohio, workers can receive care from any state certified doctor. Over 30,000 doctors are state certified. To be certified, a doctor must have a current medical license, malpractice insurance, and never have been expelled from the Medicare or Medicaid programs. The WC MCOs do have doctor networks with lower negotiated rates than the state fee schedule, and they might encourage workers to see one of their doctors. However, workers can choose any certified doctor because labor preserved this worker protection when stakeholders were finalizing the details of the WC MCOs. (personal communication, Joel Donchess)

workers with light duty. However, WC MCOs are expected to perform these functions more effectively if there are economies of scale.

After six years of record annual increases in employer costs, the Ohio state legislature passed legislation mandating managed care in an attempt to curb employer costs. The WC MCOs began operation in 1997, and representatives for labor, business, attorneys, and doctors negotiated the blueprint of the plan. There are now 27 WC MCOs in Ohio and four of them manage 70 percent of state fund claims (CareWorks, CompManagement Health Systems, GatesMcDonald HealthPlus, and Sheakley UNICOMP).[18]

2.3 Incentives to Workers' Compensation Managed Care Organizations

The second policy change I study is the return-to-work incentive, implemented in 1999. When WC MCOs were introduced in 1997, the organizations had no reason to treat the treatment and comparison groups differently. However, the structure of compensation changed after the incentive was put in place, motivating WC MCOs to focus on treatment group claims.

In Ohio, each employer contracts with a WC MCO. The state provides compensation as a function of the number of employer contracts, the number of claims incurred by those employers, and incentive pay based on how quickly injured workers return to work (and remain at work for at least 90 days). A WC MCO can be compensated by up to 8.03 percent of the premiums the employers that contract with the organization paid to the state. The compensation awarded to the WC MCO is primarily composed of two parts. For administrative expenses, each WC MCO receives 3.83 percent of the premiums the employers that contract with the organization paid to the

[18] Ohio WC MCO Report Card.

state. The WC MCO is then eligible for up to 3.45 percent of premiums if workers return to work quickly.[19]

These return to work incentives only apply to 266 of the over 1,000 five digit ICD-9 diagnosis codes. For these injuries, the state has set benchmarks for optimal return-to-work. The closer an organization's actual experience comes to these benchmarks, the higher the incentive. Benchmarks are constructed for these 266 diagnosis codes and differ by industry-occupation classification. These 266 injuries were chosen by the state because they are common workplace injuries for which benchmarks could be determined. For example, it is difficult to establish return-to-work benchmarks for traumatic head injuries, so they are primarily in the comparison group. Such a small number of workers suffer from a "thoracic invertible disc," making it difficult to establish pre-incentive trends.[20] In my sample, approximately 90 percent of lost time claims and 80 percent of all claims (including medical only) are covered by the incentive. For some injuries, the WC MCO is expected to reduce claim duration dramatically, but for other injuries the benchmark is close to mean claim duration in the years prior to the incentive. For example, before the incentive was in place, nursing home employees who sprained their backs spent an average 18.4 days out of work. The benchmark days away from work for this injury is 5.7 days, a decline of nearly 70 percent. In contrast, fast food workers with bruises on their wrist were out of work an average of 4.9 days before the incentive was implemented, and the benchmark is only 3.9 days.

The incentive is paid quarterly, based on the return-to-work history of workers who were injured and returned to work within the previous 15 months. Let Δ be an aggregate measure of how close the WC MCO comes to the benchmarks for the whole portfolio of claims:

[19] The remaining 0.75 percent of premiums the organizations are eligible to receive reflects rewards for timely and accurate reporting and encouraging employers to enroll in the "Transitional Work Grants" program. 2006 MCO Contract, Chapter 2 and Appendix E. (Acquired from a public records request to the Ohio Bureau of Workers' Compensation.)

[20] In the pre-period, only 4 lost time claimants had the ICD-9 code 722.11, thoracic invertible disc.

$$\Delta = \frac{\overline{DAYS}_{pre} - \overline{DAYS}_{actual}}{\overline{DAYS}_{pre} - \overline{DAYS}_{benchmark}}$$

Let Γ represent the maximum amount of the incentive, 3.45 percent of the premiums covered by the WC MCO. Let Φ represent the incentive payment to a WC MCO. Then the incentive is equal to[21]:

$$\Phi = \begin{cases} 0 & \text{if } \Delta \leq 0.6 \\ (\Delta - 0.59) * (20/7) * \Gamma & \text{if } 0.6 < \Delta < 0.95 \\ \Gamma & \text{if } \Delta \geq 0.95 \end{cases}$$

The incentive is illustrated in Figure 4. The schedule is a function of the claims in a WC MCO's portfolio. This figure is constructed from a sample WC MCO detailed in the contract materials provided by the OH BWC. This WC MCO has 3,811 claims in the 15-month evaluation period. If these claims return to work in 27,805 days or less, the WC MCO receives the full incentive payment. If the injured workers are away from work between 27,806 and 36,502 days, the WC MCO loses 2.9 percent of the incentive for every 250 additional days injured workers stay away from work. If the workers in the portfolio are away from work for 36,503 days or more, the WC MCO receives no incentive payment. In 2006, every WC MCO received the full incentive.

Although injuries may have different benchmarks, each day away from work counts equally against the WC MCO incentive. For a profit maximizing WC MCO, both anecdotal evidence and theory suggest the organizations will focus the most attention on the longest and most flexible claims. Since some claims will return to work within a relatively short time frame without any WC MCO intervention, the organizations only get involved with the longest claims. This prediction is also supported in theory.

Suppose the WC MCO impacts claims by calling doctors and encouraging them to release workers to the job. Assume the WC MCOs are limited to one phone call for each claim and each

[21] As of 2006, all WC MCOs operate with $\Delta>0.6$, according the MCO Report Card (OH BWC). I expect organizations with $\Delta>0.95$ to still seek to reduce days away from work because an adverse return-to-work outcome could reduce the incentive.

call incurs a constant cost in terms of labor, γL, where $0 < \gamma < 1$, and each call yields a reduction of days away from work. The WC MCO receives a bonus for each day sooner that a worker returns to the job. This is summarized by the function $g(d)$, where *d* denotes the difficulty of successfully returning a given claim to work.[22] For simplicity, assume $g'(d) < 0$ and $g''(d) = 0$. I will show the WC MCO will only choose to call doctors for the claims which will have the biggest impact. This is illustrated in Figure 5. Along the horizontal axis, injuries are ordered in increasing difficulty of returning to work. For example, nursing home employees with sprained backs fall near the origin because according to the benchmark set by the state, they are not difficult to impact. Average duration for these claims is predicted to fall by nearly 70 percent, from 18.4 days away from work to 5.7 days. Claims made by fast food workers with bruised wrists are more difficult to impact and are placed further away from the origin. Average duration for these claims is only predicted to fall from 4.9 to 3.9 days away from work.

For the branch of the WC MCO concerned with maximizing the incentive payment, profits can be described by:

$$\Pi = \left\{ \sum_{i=1}^{a} \left[g(d_i) - \gamma L \right] \right\} - wL \qquad \text{where } a * \gamma * L = L \text{ and } i \in (1, N) \text{ denotes an individual claim.}$$

Then the WC MCO makes calls to doctors on behalf of $a \in (1, N)$ claimants. The firm takes wages (w) and γ as given, and chooses L to maximize profits, yielding:

$$a = \frac{w + \lambda}{\gamma(\lambda - 1)}$$

As the labor cost of making a call rises (γ), the threshold for which injuries receive phone calls moves closer to the origin and the firm only places calls for those injuries which are the easiest to manipulate. Thus, theory predicts that the WC MCOs will invest the most on the claims which are the easiest to move. Anecdotal evidence suggests these claims are the longest.

[22] This assumes the WC MCO is on the sloped portion of the incentive schedule depicted in Figure 4.

I conduct a difference-in-differences analysis comparing claim duration for the treatment group, those injuries which qualify for incentives, with the comparison group, those incentives which do not qualify for incentives, before and after the WC MCOs and incentives are in operation.

3. Literature Review

Although no study directly addresses the link between WC MCOs and claim duration, there is suggestive evidence that programs of the type implemented by WC MCOs are effective at reducing WC claim duration. It is well established workers are responsive to benefit levels (Butler and Worrall, 1985; Hirsch, Macpherson, and Dumond, 1997; Krueger, 1990; Krueger, 1991; Meyer, Viscusi, and Durbin, 1995; Neuhauser and Raphael, 2004; Ruser, Pergamit, and Krishnamurty, 2004; and Ruser, 1985;). This result suggests there may be room for WC MCOs to influence return to work by overseeing the claim. Workers' Compensation MCOs have three main channels to use to influence claim duration: advocate aggressive medical treatment to speed recovery, encourage doctors to release the injured worker to light duty, and facilitate return-to-work by helping the employer accommodate the injured worker. Evidence suggests doctors and employers influence claim duration (Krueger, 1991; Neumark et al., 2005). These findings provide support for the hypothesis WC MCOs influence claim duration.

The WC literature has established that claims are responsive to benefit levels. When benefits become more generous, injured workers are more likely to claim cash benefits (Hirsch, Macpherson, and Dumond, 1997; Krueger, 1990; Neuhauser and Raphael, 2004; Ruser, Pergamit, and Krishnamurty, 2004; and Ruser, 1985) and receive those benefits longer (Butler and Worrall, 1985; Krueger, 1991; Meyer, Viscusi, and Durbin, 1995; and Neuhauser and Raphael, 2004). Although the magnitude of the elasticity is sensitive to the dataset used as well as the specification, it is always positive, providing evidence that workers respond to incentives.

Using matched March CPS surveys and exploiting variation in maximum benefit levels across states, the benefit elasticity of claiming ranges from 0.18 (Hirsch et al., 1997) to 0.67 (Krueger, 1990) among workers who did not claim WC in the prior year. Other studies exploit an increase in maximum benefits within a state using state or employer administrative data and find elasticity estimates of 0.77 (Neuhauser and Raphael, 2004) and 1.07 (Butler et al., 1997), respectively. Conditional on having experienced a workplace injury, Ruser et al. (2004) find an elasticity of 0.97 using the National Longitudinal Survey of Youth.

The recent duration literature can be characterized by examining the change in the duration of benefit receipt as a function of an increase in the maximum level of WC benefits using administrative data within one or two states (Krueger, 1991; Meyer, Viscusi, and Durbin, 1997; and Neuhauser and Raphael, 2004). The duration literature finds elasticity estimates ranging from 0.29 in Kentucky in the early 1980s (Meyer et al., 1995) to 1.67 in Minnesota in the mid 1980s (Krueger, 1991). Evidence that workers are responsive to benefit levels suggests there is room for WC MCOs to induce workers to return to work sooner by better overseeing the claim.

The primary methods a WC MCO can use to impact return to work are advocating aggressive medical treatment to the doctor, encouraging doctors to release claimants to light duty, and working with the employer to facilitate the worker's return to work. Two studies highlight the roles of doctors and employers in getting a worker back to work. Neumark et al. (2005) find that when employees choose a doctor with whom they did not have a pre-existing relationship, medical costs are higher and claim duration is longer. This study highlights the central role of the doctor in the injured worker's return to work. Doctors are considered gatekeepers for WC because they determine if the worker is eligible for benefits, prescribe medical care, and control when the claimant is released to return to work. Although injured workers are free to select nearly any doctor in Ohio, the WC MCO makes contact with each of the doctors caring for the injured workers in the

organization's portfolio and advocates for aggressive medical treatment and release to work. By confirming how critical the doctor's role is in claim duration, this study suggests WC MCOs can influence duration through doctors.

Workers' Compensation MCOs might also influence claim duration by encouraging employers to accommodate injured workers on the job, even for light duty. Using administrative microdata from Minnesota, Alan Krueger addresses the role of employers in a 1991 working paper. Krueger (1991) shows claim duration was shorter in the 1980s for employees whose employer was self-insured than for those whose employer was privately insured (or publicly insured). Self-insured employers bear the full cost of each claim and thus face higher WC costs than those who are insured privately. For this reason, Krueger hypothesizes self-insured employers are more likely to speed return to work by accommodating workers on the job for light duty or more closely monitoring their recovery.[23] This study suggests WC MCOs can successfully influence claim duration by facilitating return-to-work with employers. Although these two studies show doctors and employers independently influence claim duration, no study conclusively quantifies the impact of WC MCOs on claim duration.

4. Empirical Strategy

4.1 Data

In order to assess the impact of the return-to-work incentives on claim duration, I need detailed individual level data with information about claim length, the injury, and other demographic and employer characteristics which might impact the claim. I have acquired administrative data from the Ohio Bureau of Workers' Compensation representing all claims with injuries between January 1,

[23] There is a potential sample selection problem with Krueger's identification strategy. The safest large employers will choose to self-insure, so their workers are likely to be injured less severely and have a shorter duration. This would bias the estimates away from zero, suggesting that Krueger may have overstated the role of self-insurance.

1995 and December 31, 2004.[24] I focus my analysis on the subset of claims which were awarded Temporary Total Disability cash benefits because these claims are of interest to policymakers and the WC MCO is predicted to exert the greatest effort on these claims.[25]

When a worker is injured on the job, WC covers medical care immediately and begins to pay cash benefits to replace earnings losses after the worker has been away from work for at least eight days. Although claims which receive cash benefits account for only 22 percent of all WC cases, these claims comprise roughly 94 percent of all benefits paid (Sengupta et al., 2006). For this reason, efforts to reduce employer costs focus the most attention on cash benefit claims. Injured workers receiving cash benefits first receive Temporary Total Disability cash benefits, which replace two thirds of pre-injury weekly earnings. Temporary Total Disability cash benefits continue until the injured worker returns to work or is awarded a permanent disability benefit. In one third of the cash benefit claims in my sample, the injured worker is awarded cash benefits but never receives Temporary Total Disability benefits. Instead, the worker might receive permanent disability benefits for a certain injury (e.g., loss of a finger) or a lump sum payment.[26] If an injured worker receives a lump sum payment, the claim is considered settled and the worker cannot receive any additional compensation for the claim. I exclude these claims from my analysis because the WC MCO is unable to impact duration in these cases.

The subset of claims which receive Temporary Total Disability cash benefits is relevant to policymakers and receives the most attention from WC MCOs. As shown in Table 1, I have information on 172,567 claims which received Temporary Total Disability cash benefits. For each claim, I know the ICD-9 diagnosis code describing the injury, the claim's payment history, the

[24] My sample only contains those claims which were allowed by the state. I do not have any information on rejected claims.
[25] Both the extensive margin, take-up of cash benefits, and the intensive margin, claim duration, might be impacted by this policy. In Table 5, I show results suggesting the policy did not impact the extensive margin.
[26] Of these observations, 87 percent receive permanent partial disability benefits and 34 percent receive a lump sum amount. These categories are not mutually exclusive.

claimant's pre-injury weekly earnings, a few demographic characteristics (year of birth, marital status, gender), the employer's industry, and the worker's occupation. I can also identify employers and control for their loss history.[27]

For the comparison group to be valid, I need to be sure that any trends impacting the treatment group will affect the comparison group in the same way. I can be most confident that this is the case if the two groups are reasonably similar in the pre period. First, I examine pre period trends in duration. For each five digit ICD-9 diagnosis code, I regress duration on a constant and a quarterly time trend. Several comparison group injuries have pre period trends outside of the common support, so I exclude these observations. I further restrict the sample to those injuries with a pre period trend falling between [-0.1, 0.1] because over 90 percent of treatment group observations fall in this range. In Figure 6, I present pre period trends in duration for the treatment and comparison groups. After matching on pre period trends, the trends are the same for both groups.

Roughly seven percent of the sample is right-censored. Since I am analyzing a policy change predicted to reduce claim duration in the post period, it is imperative that I treat these observations carefully so that I do not overstate my results. The last injuries I observe occurred on December 31, 2003, and the last return-to-work date in the sample is December 31, 2005. Therefore, to impose a consistent censoring point on the entire sample, I truncate all spells at two years and consider all spells longer than two years to be censored. With this modification, nearly 18 percent of the sample is censored, as shown in Table 2.

4.2 Measuring the Impact of the Return-to-Work Incentive

[27] In each year, I see the employer's experience modification factor and an indicator describing whether or not the employer is experience rated.

I use a difference-in-differences strategy to evaluate whether or not the return-to-work incentive effectively decreases claim duration. A claimant's return to work history is included in the incentive calculation if the injured worker is diagnosed with one of the 266 injuries in the treatment group. I compare the change in ln(days away from work) before and after the incentive is implemented for claims which will count toward the incentive, the treatment group, with the change in duration for claims which are not included in the incentive calculation, the comparison group. If the incentive is effective at reducing duration, I expect to see a bigger decrease in ln(days away from work) among those claims which qualify for the incentive than for those that do not. I include the comparison group to capture any underlying trends in days away from work so I can isolate the impact of the incentive.

The WC MCOs were in place for two years before the incentives were implemented, so as a specification test I also measure the impact of the organizations on the duration of the treatment group claims. A priori, I do not expect the introduction of the WC MCOs, without the incentives in place, to have a differential impact on the treatment group claims. Let PRE_t represent the period before WC MCOs were introduced (1/95-2/97), $POST1_t$ identify the months after the WC MCOs are in place but before the incentives are implemented (3/97-3/99), and $POST2_t$ quantify the period when the WC MCOs and the return to work incentives are both in effect (4/99-12/04). Let $TREAT_j$ indicate those claims which have injuries that will count toward the incentive. I estimate $\ln(\text{days away from work})_{i,j,t}$ as a function of having an injury which will qualify for the incentive, captured in the vector of diagnosis fixed effects, γ_j; an indicator for the period marked by the first policy change when the WC MCOs are in place but the incentive is not, $POST1_t$, and an indicator

for the second policy change when the WC MCO and incentive are both in place, $POST2_t$.[28] I also include interactions between $POST1_t$*$TREAT_j$ and $POST2_t$*$TREAT_j$.

In this case, the left out category is PRE_t, the period before the WC MCOs are in place. Let the coefficient on $POST1_t$*$TREAT_j$ be λ_{post1} and the coefficient on $POST2_t$*$TREAT_j$ be λ_{post2}. Then λ_{post1} represents the impact of the WC MCOs on the treatment group, the "WC MCO effect." The coefficient λ_{post2} represents the isolated impact of the return-to-work incentive on the treatment group, called the "incentive effect." I expect the "WC MCO effect" to be zero because in the absence of the incentive, I do not think the WC MCO treats return-to-work differently for the treatment and the comparison groups. If the return-to-work incentive effectively decreases duration, then the "incentive effect" will be negative.

I also include job and demographic characteristics and measures of an employer's loss history in the vector $X_{i,f}$, and year effects in the vector η_t.

$$\ln(DAYS)_{i,f,j,t} = f(POST1_t, POST2_t, TREAT_j * POST1_t, TREAT_j * POST2_t, X_{i,f}, \eta_t, \gamma_j)$$

This strategy is illustrated in Figure 7 for the subset of claims having injuries in the 3-digit ICD-9 codes shown.[29] Before the WC MCOs were introduced, no injury qualifies for the incentive. The WC MCOs were put in place in March 1997, but the incentive was not yet implemented so no injury qualifies for the incentive. Beginning in 1999, the incentive impacted some claims. There is variation within 3-digit codes ICD-9 codes in the share of claims counting toward the incentive and there is also variation across injuries. For example, 94 percent of back sprains and strains count toward the incentive, but only 75 percent of open elbow wounds. At the extremes, no hernias count toward the incentive and all cases involving carpal tunnel syndrome impact the reward payment.

[28] I do not include five digit ICD-9 code effects because this resulted in cells that were too small for quantile regression. Instead, I include dummies for three digit ICD-9 codes crossed with treatment dummies.
[29] In this figure, I have taken a subset of claims with injuries occurring in the pre period.

Roughly 90 percent of all claims have injuries which qualify for the incentive, and the ten percent of claims which comprise the comparison group look relatively similar to the treatment group claims. Pre period demographic, employer, and job characteristics are remarkably similar between the two groups, as shown in Table 3. Nearly 70 percent of the sample is male, just over half of all claimants are married, and the average injured worker is 38 years old. Mean benefit replacement rates for the treatment and comparison groups are 68.9 percent and 65.5 percent, respectively. Over 35 percent of the sample works in manufacturing, nearly 20 percent works in services, and approximately 15 percent works in construction. Approximately 45 percent of the claimants are production workers, 20 percent are laborers, and roughly 24 percent work in service occupations. Employer experience rating and loss history are strikingly similar between the two groups. Over 40 percent of claimants work for employers who are experience rated and less than 15 percent of claimants work for base rated employers.[30]

The biggest difference between the treatment and comparison groups is in the composition of injuries. This is to be expected because the 266 injuries which qualify for incentives were chosen in part because they are non-traumatic injuries. As shown in Table 4, even though the injuries are not perfectly similar, there is some overlap in the body part injured and the nature of the injuries. Sprained backs or necks comprise 28 percent of all treatment group injuries and 16 percent of all comparison group injuries. Fractured arms account for just over five percent of all treatment group injuries but 16 percent of all comparison group injuries. I do expect to see differences between the two groups, and the comparison group is nearly three times as likely to suffer a head injury as the treatment group (comprising 14.3 and 4.6 percent of injuries, respectively). The treatment group is much more likely to suffer a cut on the hand than the comparison group (comprising 5.4 and 0

[30] Employers must have over $8,000 in expected losses to be experience rated. Both large and small employers are eligible to join group experience rating plans through their professional associations. Small employers who choose not to join groups are base rated. That is, their loss history does not impact their premiums.

percent of injuries, respectively). I present these comparisons to provide a sense of the data and the treatment and comparison groups. However, the differences do not jeopardize my analysis because by including diagnosis fixed effects, I compute within-group estimates.

I do not expect any trend to impact claims in the treatment group differently than the comparison group. As shown in Table 3, the workers and the jobs are rather similar across the two groups. The only way the groups differ is by injury, but it is difficult to imagine a scenario in which comparison group injuries are treated differently than treatment group injuries, especially because there is some overlap in the general injury types. For example, suppose technology changed to better accommodate workers with sprained ankles on the production floor. Then this innovation would speed return-to-work for injured workers with sprained ankles, whether or not their injuries are classified as treatment or comparison. As a specification test, I will run this analysis on the subset of injuries with 3-digit ICD-9 codes containing both treatment and comparison injuries.[31]

I present results from censored regression, quantile regression, and censored quantile regression models. I predict the incentive has heterogeneous impacts across the distribution and this methodology will allow me to fully capture the different treatment effects.[32] Since I am comparing duration between the pre and post periods for a policy predicted to decrease duration, if I do not treat censored observations carefully then I might artificially create shorter durations in the post period and overstate my results. Because of the way the incentive is structured, WC MCOs are predicted to focus efforts on reducing duration of the longest claims. For this reason, I expect to find heterogeneous treatment effects—large reductions at the top of the distribution and no reduction at the bottom of the distribution.

[31] As shown in Appendix A, making this restriction does not change the conclusions of the analysis.
[32] I choose quantile regression over a hazard model because I believe the incentives have the greatest impact on the longest claims. To capture this in a hazard model, I would have to have to include interactions between the variables of interest (PRE*TREAT, POST*TREAT) and various length of claim controls (Meyer, 1990). This is essentially what I am doing with the quantile regression model.

4.4 Results

I first present estimates of the impact of the policy changes on the extensive margin, whether or not a claim receives cash benefits. For example, the WC MCOs might induce claims to drop from nine to six days. A decline like this would induce a claim to no longer receive cash benefits because workers must miss at least eight days of work to qualify for cash benefits. If this is the case, the extensive margin should not be neglected. As shown in Table 5, neither policy change affected the extensive margin. The marginal effects are very small in magnitude and not statistically significant. This finding allows me to confidently focus attention on the intensive margin, claim duration.

Next, I present estimates from censored regression in Table 6.[33] I find no "WC MCO effect" for the treatment group. The coefficient is small in magnitude and not statistically significant. This specification test confirms that in the period before the incentive was implemented, the treatment and comparison groups were treated similarly. I find the incentive induced WC MCOs to reduce duration by nearly eight percent, on average. I individually add the covariates to the model and find the result is qualitatively the same no matter which covariates are included. This suggests the incentive effectively reduced days away from work for treatment group injuries.[34] Theory and anecdotal evidence predict the incentive will induce WC MCOs to focus efforts on the longest claims. Using quantile regression techniques, I am able to determine whether or not these changes are distributed equally across the distribution of claim duration.

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[33] To date, the WC duration literature has either dropped all spells which are right censored (Neuhauser and Raphael, 2004) or truncated all observations at time T and assumed they represent completed spells (Krueger, 1991; Meyer, Viscusi, and Durbin, 1995). Far more of my observations are right censored than in those papers. As shown in Table 2, approximately 18 percent of all observations are right censored. In contrast, less than one percent of claims are right censored in the papers by Meyer et al. (1995) and Krueger (1991). (It is unclear how many observations are right censored in Neuhauser and Raphael (2004).) Therefore, it is important for me to treat these censored observations carefully because my treatment of them could drive the results.

[34] When I instead model predictors of the level variable, "Days Away from Work," I cannot conclude the WC MCOs had any impact on the duration of treatment group claims. The coefficients are large, a drop of 7.8 days, but statistically insignificant and a F-test fails to reject the null hypothesis that the two interaction terms are equal. When I do not truncate all spells at two years, the effect grows. These results are presented in Appendix B.

Following Meyer et al. (1995), I present quantile regression results, and I also incorporate preliminary results using the Censored Least Absolute Deviations (CLAD) estimator. The CLAD estimator alternates between predicting duration for each observation and trimming those observations for which $X'\beta$ falls outside the uncensored region and doing quantile regression on the remaining observations (Chay and Powell, 2001). I present results from quantile regression in Figures 8a and 8b. The coefficient estimate for different quantiles is depicted by the thick middle line and the dashed outer lines bound the 90 percent confidence interval. Each specification includes dummies for POST1 and POST2; the interaction terms POST1*TREAT and POST2*TREAT; year dummies; diagnosis fixed effects; and the complement of demographic, employer, benefit, earnings, and job characteristics. In Figure 8a, the "WC MCO effect," the impact of the WC MCOs on the treatment group before the incentive is implemented, is indistinguishable from zero through the 74th percentile. However, above the 75th percentile, the WC MCOs actually appeared to increase duration for the treatment group in the absence of the incentive payment. I believe this upward trend is actually a function of the censoring. In Appendix C, I present results from the first policy experiment only. Since the last date of injury I observe for this sample is 3/31/99, I can impose a longer uniform censor point than two years. With this longer censor point, I no longer see this upward trend in the right hand tail, suggesting censoring drives this upward trend in the right hand tail.

The "incentive effect" is depicted in Figure 8b. First, duration decreased at the very bottom of the claim duration distribution. It is easy to imagine a scenario such that it is relatively easy to speed return-to-work for some of the shortest claims. Without an incentive to speed return-to-work, some claimants may be ready to work but face delays in claim processing. If the WC MCO merely processes treatment group claims more quickly, return-to-work can improve by a large percentage for little effort. In Appendix B, I present results with the dependent variable in levels,

days away from work, and the effect is concentrated in the top half of the distribution of claim duration. The "incentive effect" depicted in Figure 8b is negative but indistinguishable from zero from the 12th through the 55th percentile. The effect becomes statistically significant and grows in absolute value to a 7.8 percent decline at the 70th percentile before falling to 2.3 percent at the 78th percentile. As seen in the results for the WC MCO effect, duration appears to increase at the right hand side of the distribution, but I believe this upward trend is also a function of censoring. As expected, these results confirm the incentive induces WC MCOs to reduce duration among the longest claims.

As an additional confirmation of this finding that the impact of the incentive is concentrated in the top half of the claims distribution, I also present CLAD results in Figures 9a and 9b. With CLAD, I cannot incorporate diagnosis fixed effects because I would not necessarily be trimming the distribution for each ICD-9 equally in each period. Therefore, in place of diagnosis fixed effects, this specification includes controls for categories of injuries and a treatment group indicator. The categories are the broad classifications presented in Table 4. In Appendix D, I present results from censored and quantile regression using these categories and the qualitative conclusions are similar to the results presented thus far.

The "WC MCO effect" is similar to the estimates using quantile regression. The coefficient is small in magnitude and not statistically significantly different than zero through much of the distribution.[35] As in the results from quantile regression, the "incentive effect" is negative. The CLAD results differ from the quantile regression results because the effect is different than zero across the entire swath of the distribution presented. The incentive induces between a four and six percent decline in duration between the 15th and 40th percentiles. Similar to the results from quantile regression, the result is largest in the left hand tail and the top of the distribution. Among the

[35] The upward trend in the right hand tail is present, but in future work I will adapt CLAD to accommodate random censoring and expect this upward trend to be ameliorated.

shortest claims, the incentive induces workers to return to the job roughly seven percent more quickly. Between the 45th and 70th percentiles, the incentive induces workers to return to the job between seven and ten percent more quickly. Accounting for censored observations using CLAD does not change the conclusions from the specification test; the treatment and comparison groups are treated similarly in the period before the incentive was implemented. Nuanced conclusions about the "incentive effect" do differ between the two approaches because the effect is larger in absolute value and significant across a wider swath of the distribution. The main result that the effect is larger for the longest claims remains unchanged.

One concern is that larger, more dangerous employers already have disability management or return-to-work programs in place before either the WC MCOs or incentive were implemented. These programs speed return-to-work in the same way that I hypothesize the WC MCOs will act on the treatment group. Since most workers are employed by large employers, not accounting for these types of programs might bias results toward zero. To address this concern, I restrict the sample to workers whose employers have claims filed in the pre period. I construct ten indicator variables representing the deciles of the injury-weighted pre-period injury distribution.[36] The sample size falls from 172,567 to 157,566. In Table 7, I present censored regression results for this sample with and without the size controls. I find the results are qualitatively similar to those on the full sample whether or not I include the controls for employer size. The "WC MCO effect" is small in magnitude and not statistically significant and the "incentive effect" yields an eight percent decrease in duration.[37] In Figures 10a through 10d, I present the corresponding quantile regression estimates and the qualitative conclusions remain unchanged.

[36] I construct size for each employer using all claims, including medical only. I do not impose the restrictions used to create the final sample.

[37] Ideally, I would include employer fixed effects but this proved too computationally difficult for censored and quantile regression. There are over 50,000 employers in the sample. As a next step, I propose to take a random sample of

A possible threat to this strategy would be if WC MCOs are re-labeling claims thereby changing the composition of the treatment and comparison groups. There is evidence suggesting that one response to incentives is to change how a diagnosis or procedure is coded to garner higher Medicare reimbursement (Dafny, 2003; Silverman and Skinner, 2003) or change a commodity's tax category to pay a lower tax rate (Fisman and Wei, 2004). For some injuries, the diagnosis is clear, such as a fractured ankle, and for others, one of several diagnosis codes might be appropriate. In fact, there are over 25 five digit ICD-9 codes which reference an "unspecified sprain or strain of the back or neck" and only six of these count toward the return-to-work incentive.[38] The reward earned on each claim is an increasing function of how quickly the worker returns to work, relative to the benchmark. Thus, the incentive is higher if computed on shorter claims and the reward is reduced by longer claims. Ideally, the WC MCO would move the less serious claims from the comparison group into the treatment group and move the most serious claims from the treatment group into the comparison group. Despite these incentives, the link between the WC MCO incentive and the diagnosis coding is tenuous because the WC MCO receives the incentives, but the doctor assigns the diagnosis code, in many cases before the WC MCO is involved in the claim. In Ohio, injured workers can see nearly any doctor they choose. This means that a worker might choose a doctor with whom the WC MCO has no relationship, making it even more difficult for the organization to influence the diagnosis.

To address the concern of re-labeling, I first identify those injuries which experienced a large increase or decrease in the share of claims which qualify for the incentive. These summary statistics are presented in Appendix E. It is possible that the change in composition for these injuries reflects re-labeling. I then estimate my censored regression results excluding those injuries with large

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employers and test results with employer fixed effects for the smaller subset. Size categories of pre period injuries by employer are endogenous to claim incidence but not claim duration, which is what I measure.

[38] Provided by the Workers' Compensation Research Institute.

changes in composition over the time period. I do this for three definitions of injury: three digit ICD-9 code, 18 injury classifications which I constructed, and six broad injury categories described in the index of ICD-9 codes. Censored regression results are presented in Table 8. I present results from the following four samples. In column 1, I exclude the three digit ICD-9 codes which experienced large changes in the share of injuries qualifying for the incentive. The sample in column 2 excludes three injury categories: head injuries, fractured backs or necks, and cuts on the arm. In column 3, I exclude all musculoskeletal diseases. Further inspection of the musculoskeletal disease category revealed the change in the share incentive was driven by workers suffering from back pain, so in column 4, I make only that restriction.

In all but one case, the results are qualitatively unchanged from my main finding. The "WC MCO effect" is small and insignificant, and the "incentive effect" yields between a six and seven percent reduction in days away from work. When I exclude all musculoskeletal diseases, these general findings do not hold. However, I think that restriction is too broad. Quantile regression results for these four samples are presented in Figures 11a through 11f. Similar to the censored regression results for these four subsets, my main findings are confirmed for every sample except for the exclusion of all musculoskeletal injuries. I find no "WC MCO effect" for the treatment group, and the "incentive effect" is the largest in the top half of the distribution of claim duration. Since my main findings are confirmed for all but one restriction, and because I argue that restriction is too broad, I conclude re-labeling does not pose a threat to my results.

5. Conclusion

I find that the return-to-work incentive induced WC MCOs to effectively decrease days away from work on average, with effects concentrated in the bottom tail and the top half of the claim duration distribution. For the shortest claims, workers might not be healing any more quickly but perhaps

the claim management process put in place by the WC MCOs is more effective at reducing unnecessary delays in returning to work. Theory and anecdotal evidence suggest the incentive will have the biggest impact on the longest claims, and my empirical results confirm this hypothesis.

This result is generalizable beyond the Ohio case study presented in this paper. Although the exact structure of the organizations may differ, I have shown that without an incentive payment, profit maximizing WC MCOs are no better at encouraging return-to-work than the state fund or employers, and that the incentive payment effectively reduced duration for some of the longest claims. These findings can be generalized to other states or to employers writing contracts with WC MCOs or third party claims administrators.

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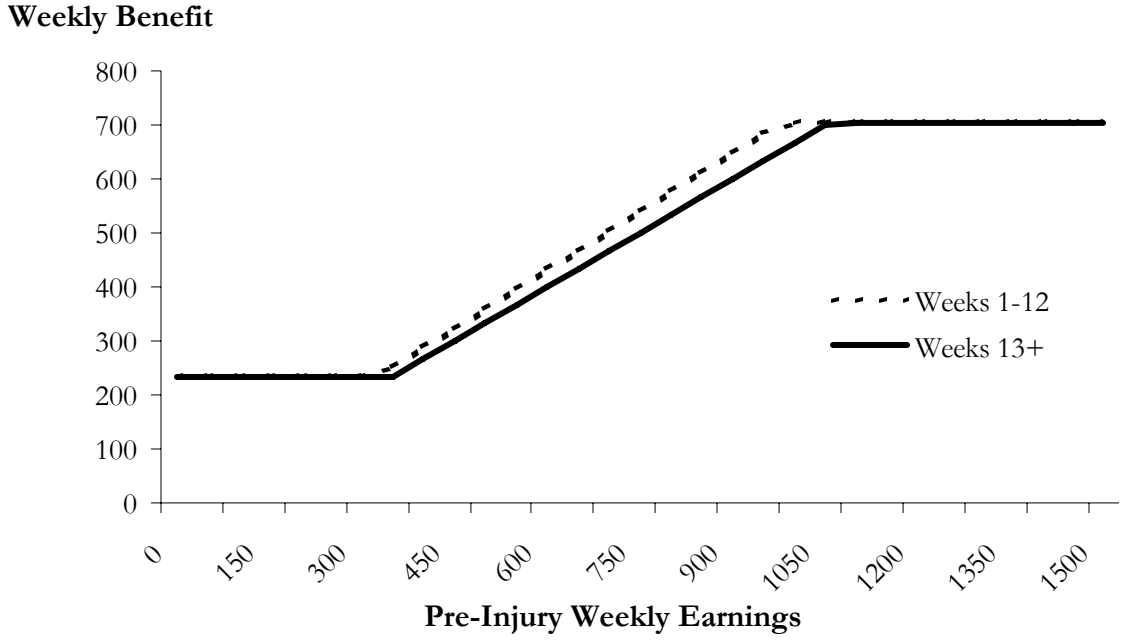
Figure 1: Schedule of Ohio Temporary Total Disability Cash Benefits, 2006



SOURCE: U.S. Department of Labor

Figure 2: Introduction of Ohio WC MCOs and Implementation of the Return-to-Work Incentive

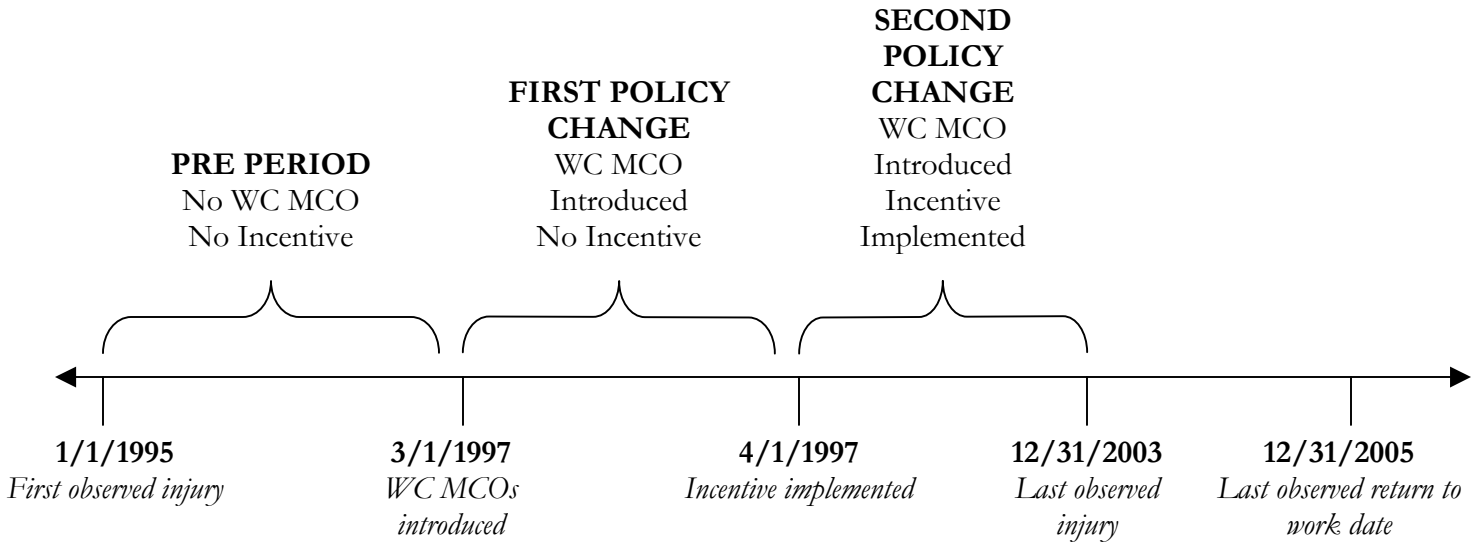


Figure 3: Path of a Workers' Compensation Claim in Ohio

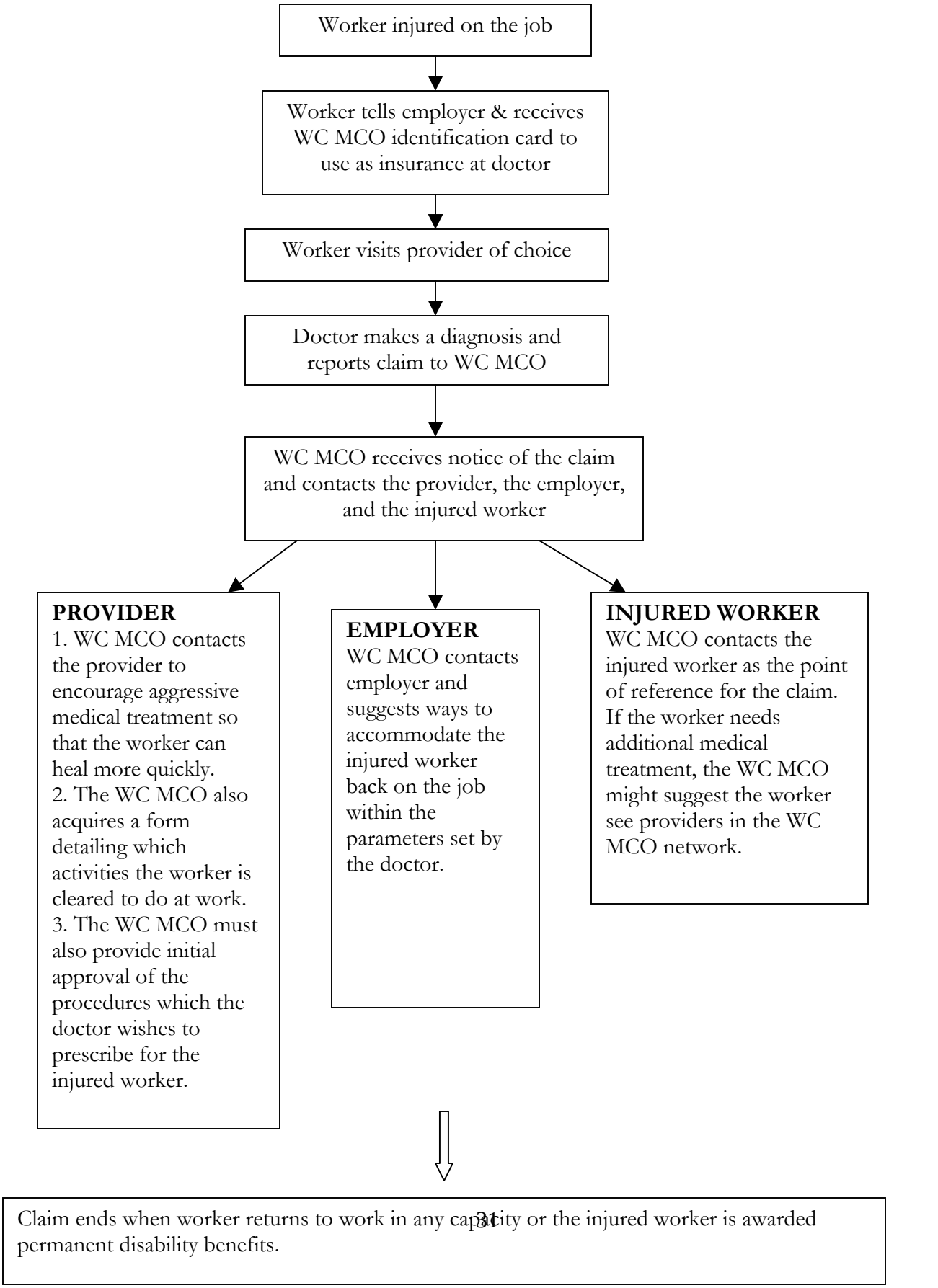
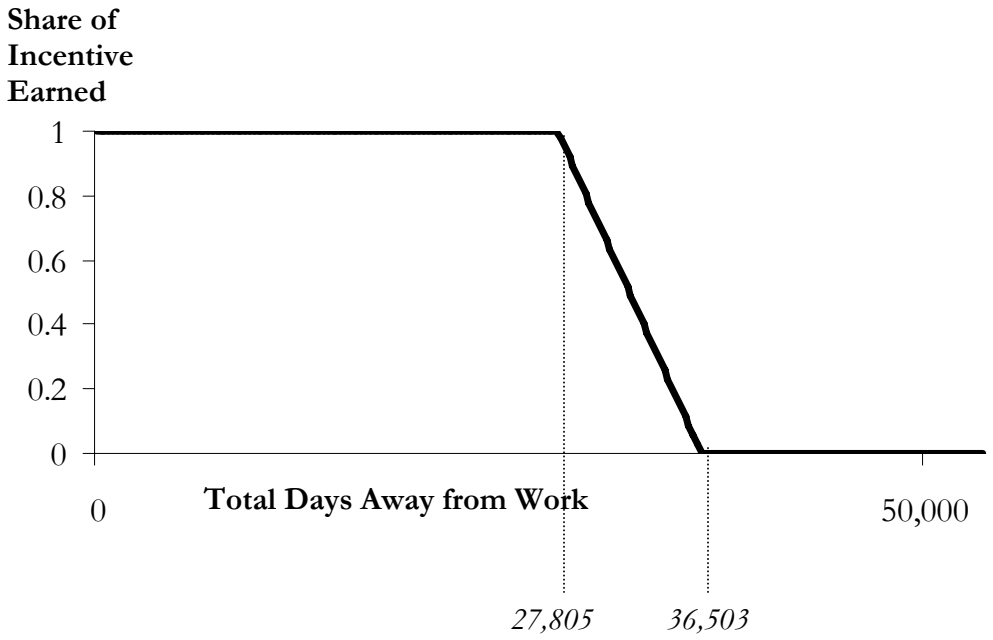


Figure 4: Structure of Incentive Payments to WC MCOs



SOURCE: Author's Calculations from Sample WC MCO detailed in WC MCO Contract

Figure 5: Characterization of Incentives to WC MCO

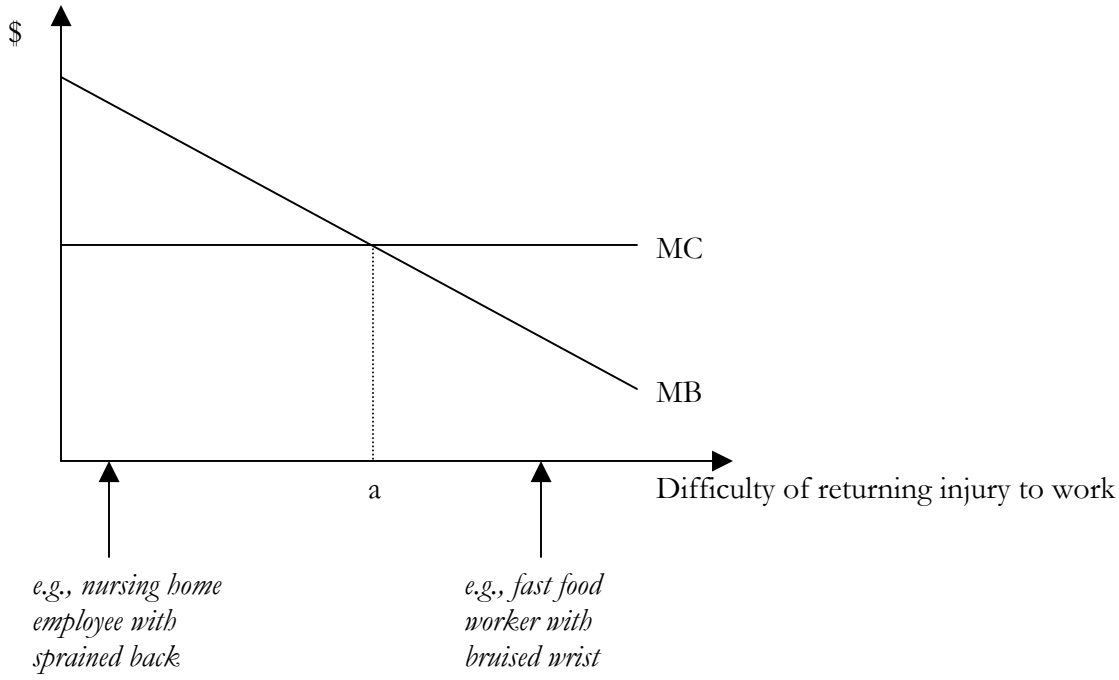


Figure 6: Pre Period Trends in Duration for the Treatment and Comparison Groups

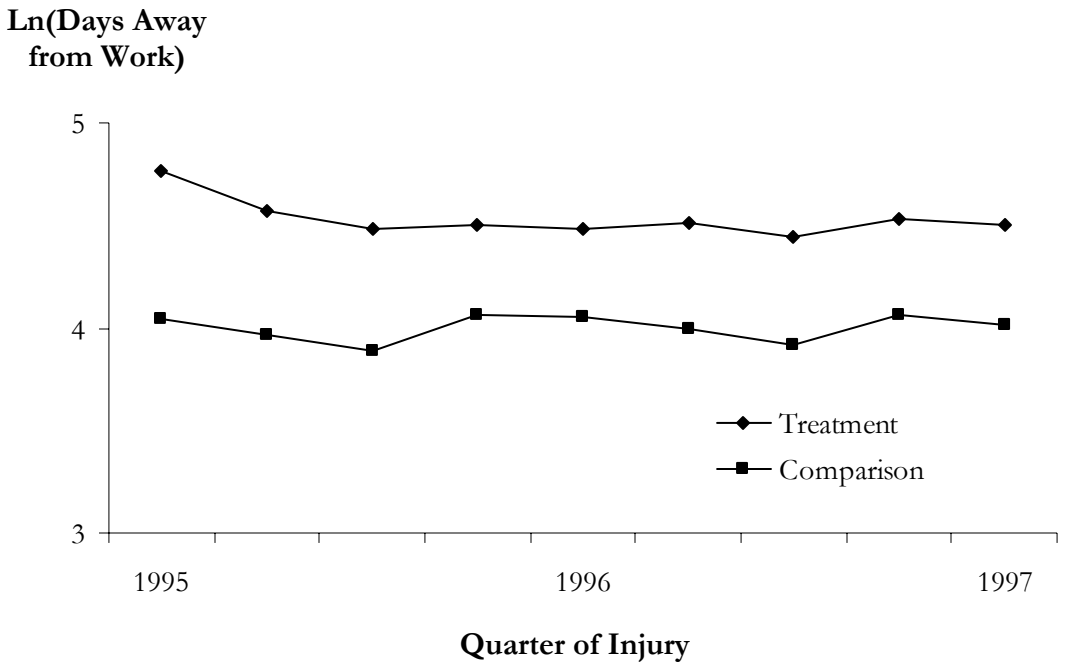
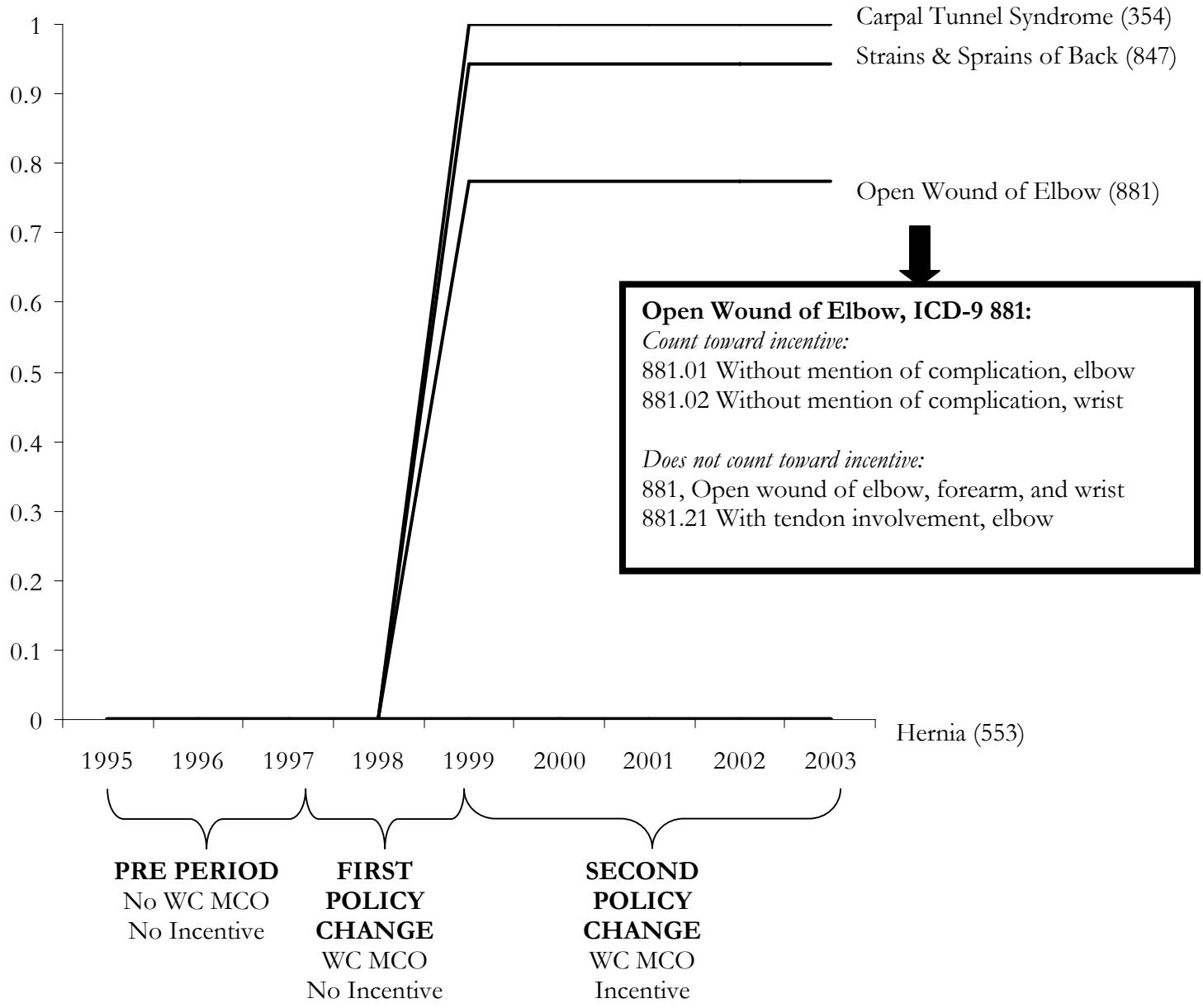


Figure 7: The Impact of Incentives Over Time and Across Seven Three-Digit ICD-9 Diagnosis Codes
(Using Sample of Injuries Occurring in pre period; 3-Digit ICD-9 Codes are in Parentheses)



SOURCE: Author's Calculations from Ohio Bureau of Workers' Compensation Data

Figure 8a: WC MCO Effect
Coefficients from Quantile Regression on Ln(Days Away from Work)

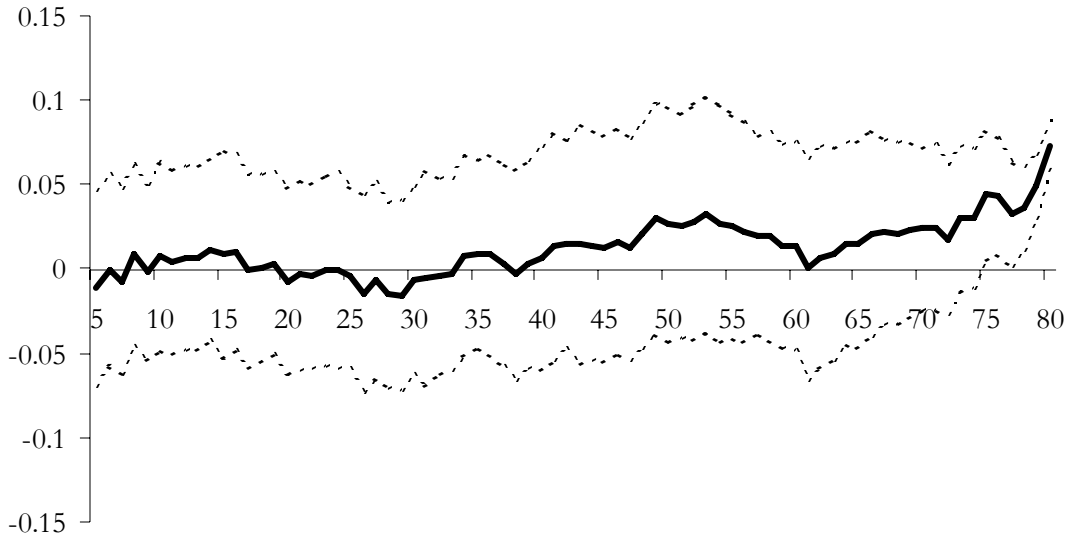
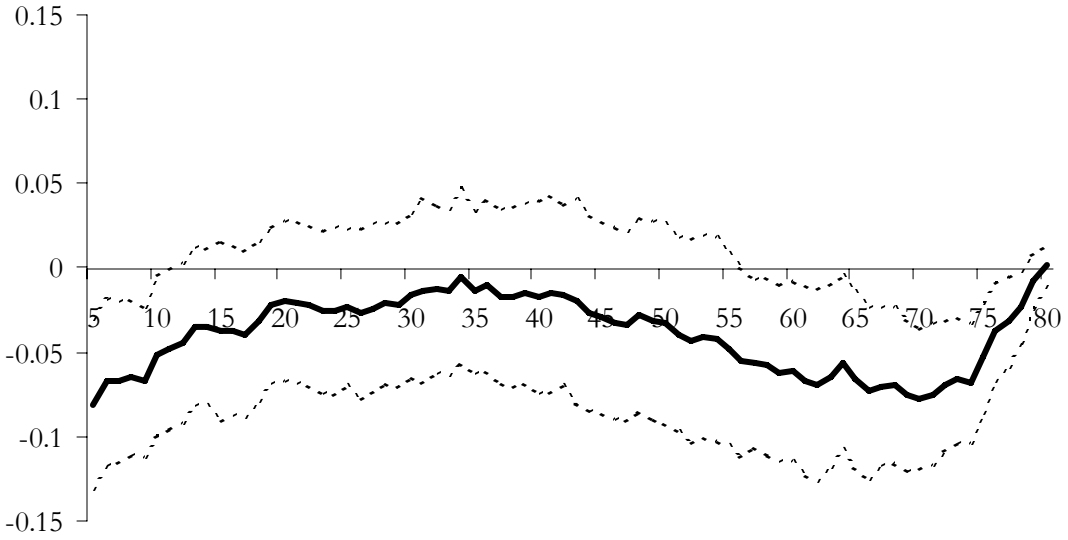


Figure 8b: Incentive Effect
Coefficients from Quantile Regression on Ln(Days Away from Work)



Notes: The middle line represents the coefficients obtained by quantile regression for the variables POST1*TREAT and POST2*TREAT. The outer lines bound the 90 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, POST2, diagnosis effects, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation. In results not shown here, I also include Log(Weekly Benefit) and Log(Weekly Earnings) and find similar results.

Figure 9a: WC MCO Effect
Coefficients from Censored Least Absolute Deviations on Ln(Days Away from Work)

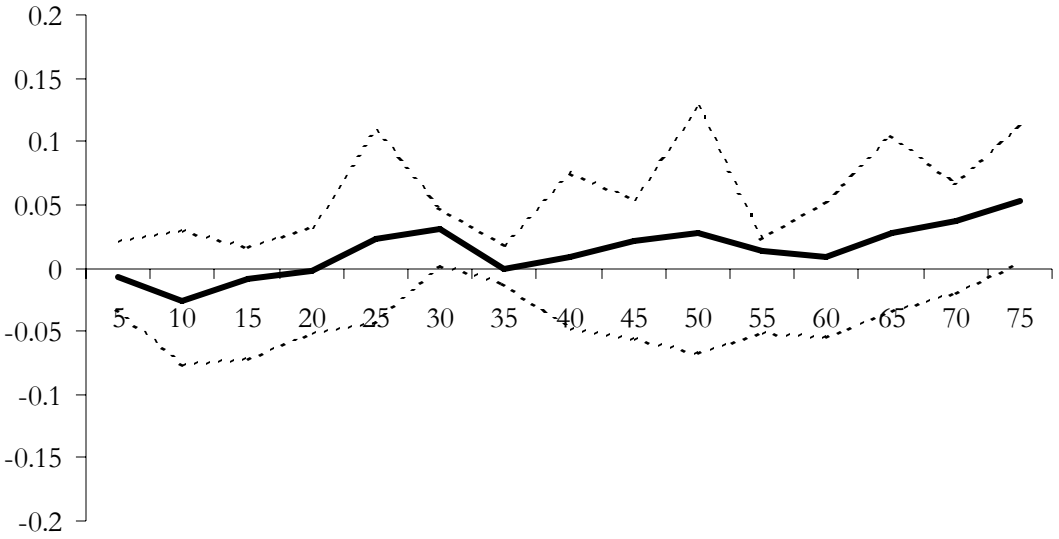
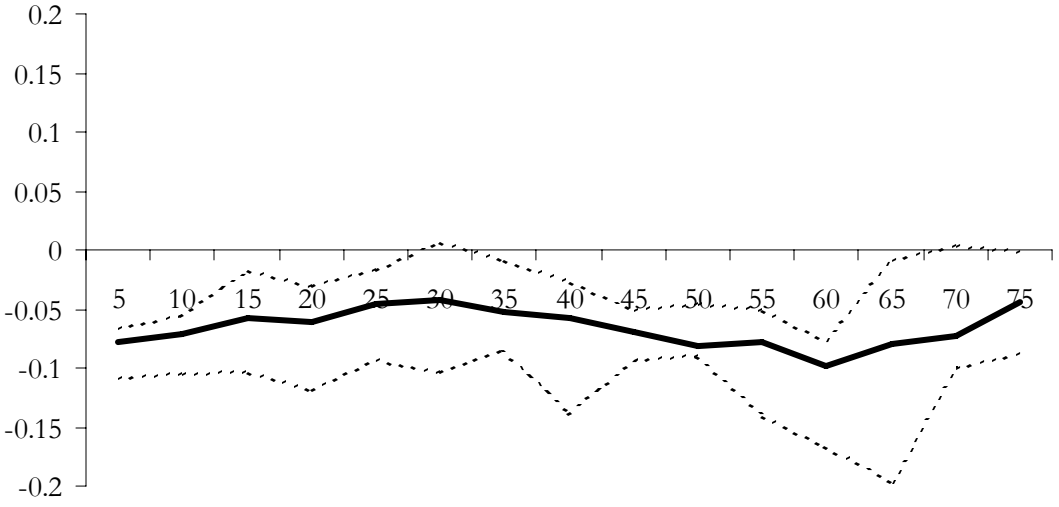


Figure 9b: Incentive Effect
Coefficients from Censored Least Absolute Deviations on Ln(Days Away from Work)



Notes: The middle line represents the coefficients obtained by Censored Least Absolute Deviations for the variables POST1*TREAT and POST2*TREAT. The outer lines bound the 95 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, POST2, 18 injury categories, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation. Results shown here are for the 25th, 30th, etc. percentile, and each has a maximum of ten iterations and ten bootstrap replications.

Figure 10a: WC MCO Effect
Coefficients from Quantile Regression on Ln(Days Away from Work)
Employer size sample, no employer size effects

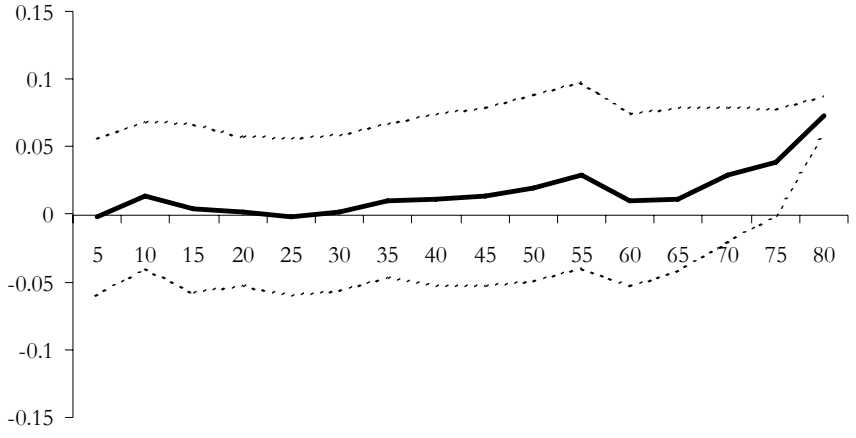


Figure 10c: WC MCO Effect
Coefficients from Quantile Regression on Ln(Days Away from Work)
Employer size sample, with employer size effects

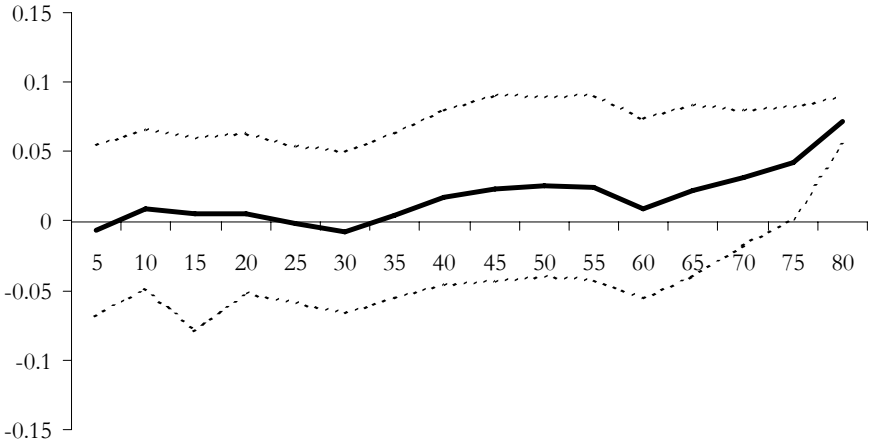


Figure 10b: Incentive Effect
Coefficients from Quantile Regression on Ln(Days Away from Work)
Employer size sample, no employer size effects

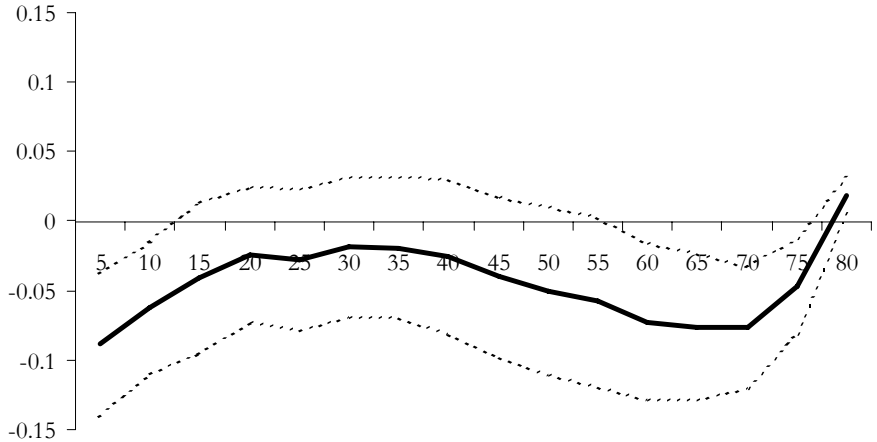
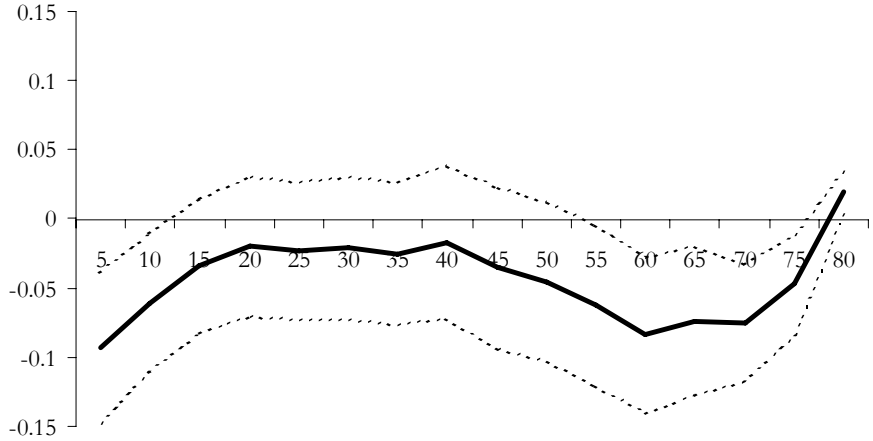


Figure 10d: Incentive Effect
Coefficients from Quantile Regression on Ln(Days Away from Work)
Employer size sample, with employer size effects



Notes: The middle line represents the coefficients obtained by quantile regression for the variables POST1*TREAT and POST2*TREAT. The outer lines bound the 90 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, POST2, diagnosis effects, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation.

Figure 11a: WC MCO Effect

Coefficients from Quantile Regression on Ln(Days Away from Work)
Excluding ICD 727 (Rheumatism, excluding back) and ICD 881(Open wound of elbow, forearm, and wrist)

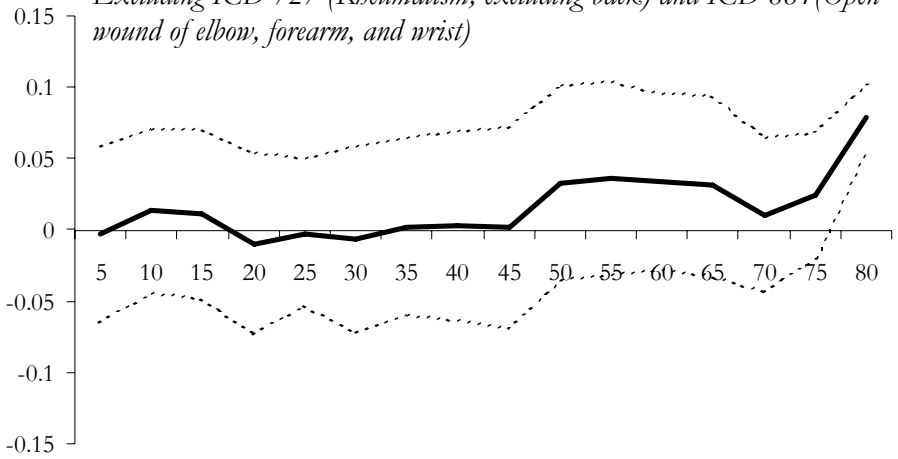


Figure 11c: WC MCO Effect

Coefficients from Quantile Regression on Ln(Days Away from Work)
Excluding head injuries, fractured backs or necks, and cuts on the arm

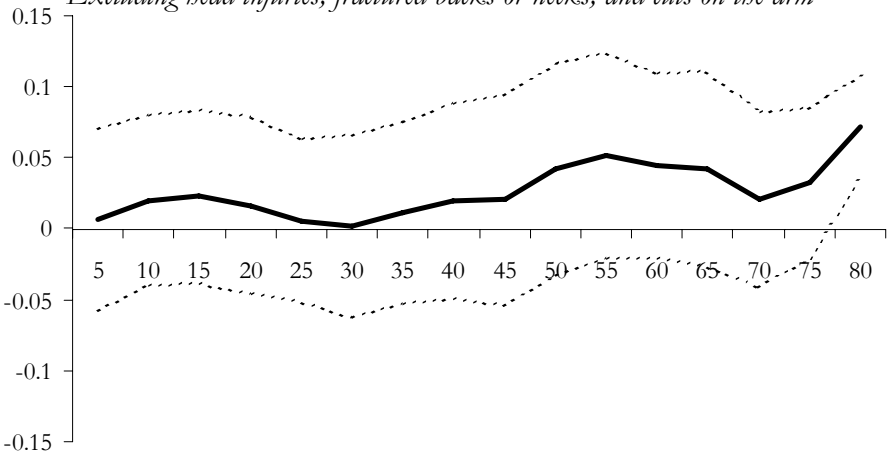


Figure 11b: Incentive Effect

Coefficients from Quantile Regression on Ln(Days Away from Work)
Excluding ICD 727 (Rheumatism, excluding back) and ICD 881(Open wound of elbow, forearm, and wrist)

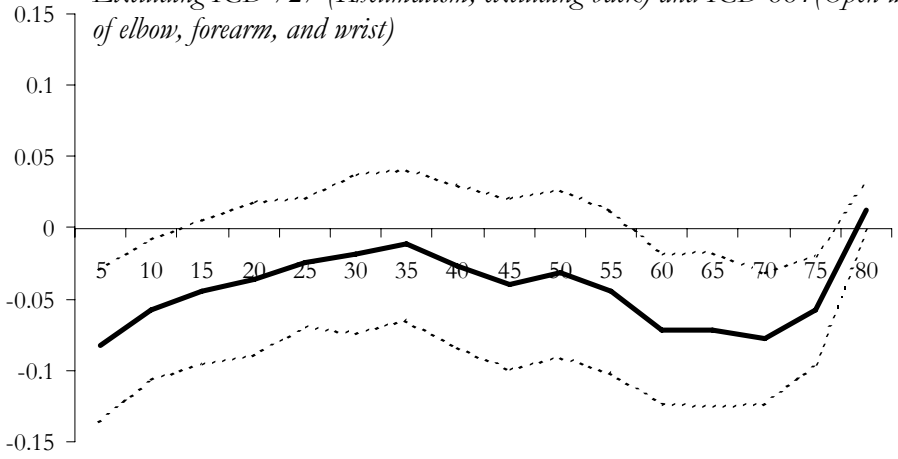
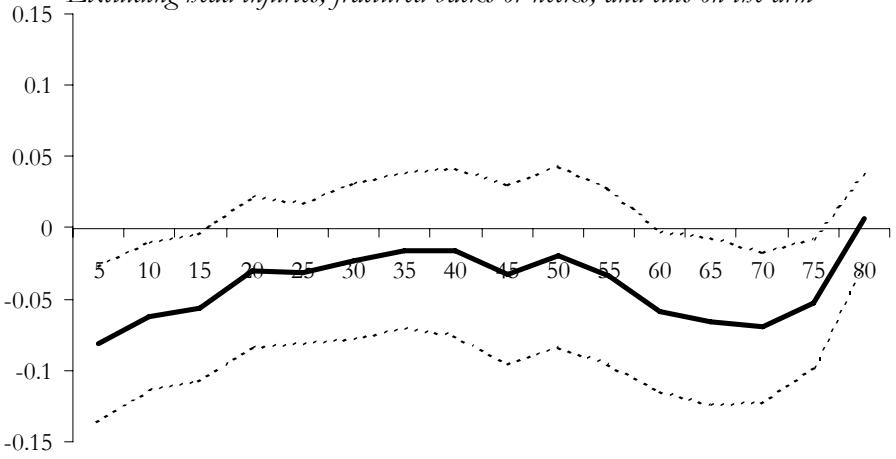


Figure 11d: Incentive Effect

Coefficients from Quantile Regression on Ln(Days Away from Work)
Excluding head injuries, fractured backs or necks, and cuts on the arm



Notes: The middle line represents the coefficients obtained by quantile regression for the variables POST1*TREAT and POST2*TREAT. The outer lines bound the 90 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, POST2, diagnosis effects, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation. I also include Log(Weekly Benefit) and Log(Weekly Earnings).

Figure 11e: WC MCO Effect

Coefficients from Quantile Regression on Ln(Days Away from Work)
Excluding all diseases of the musculoskeletal system (ICD 710-739)

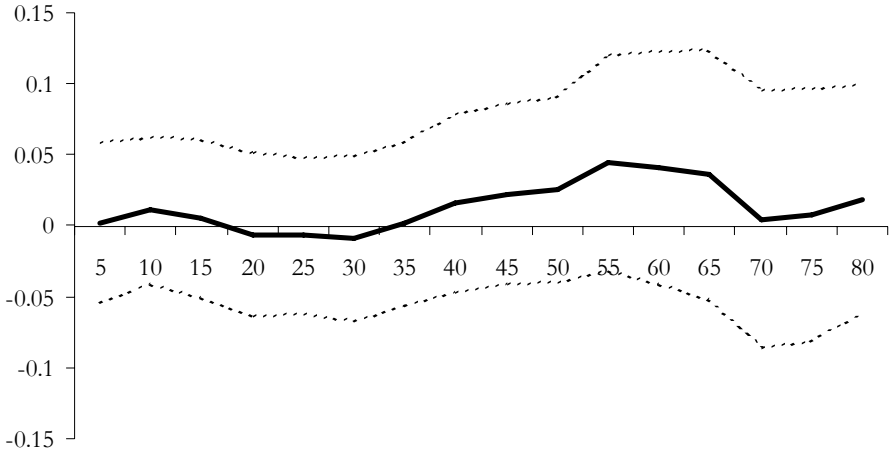


Figure 11fg: WC MCO Effect

Coefficients from Quantile Regression on Ln(Days Away from Work)
Excluding dorsopathies (back pain) (ICD 720-724)

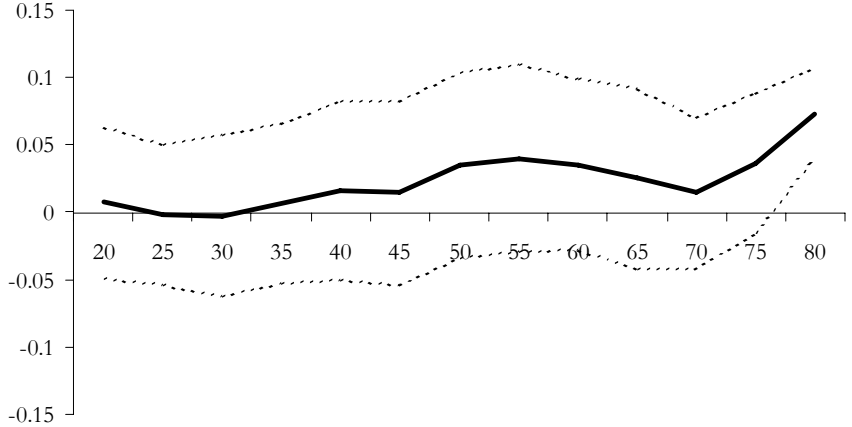


Figure 11f: Incentive Effect

Coefficients from Quantile Regression on Ln(Days Away from Work)
Excluding all diseases of the musculoskeletal system (ICD 710-739)

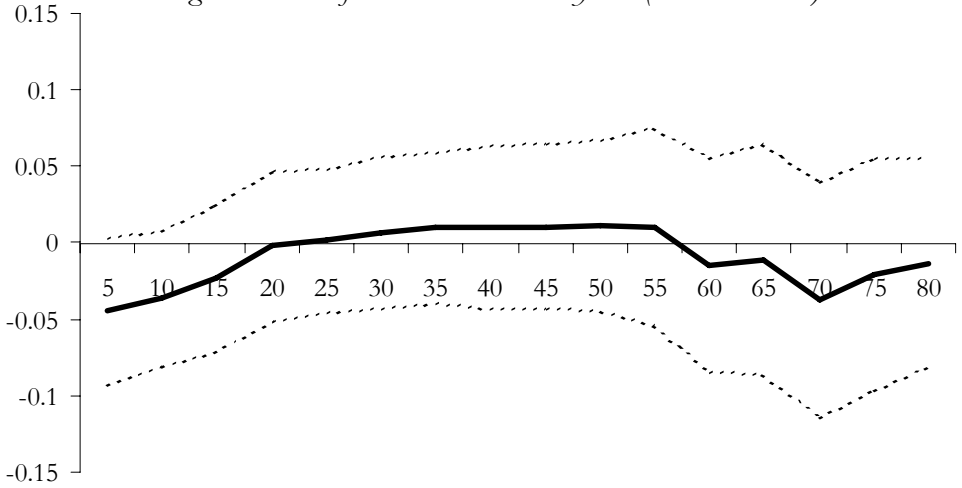
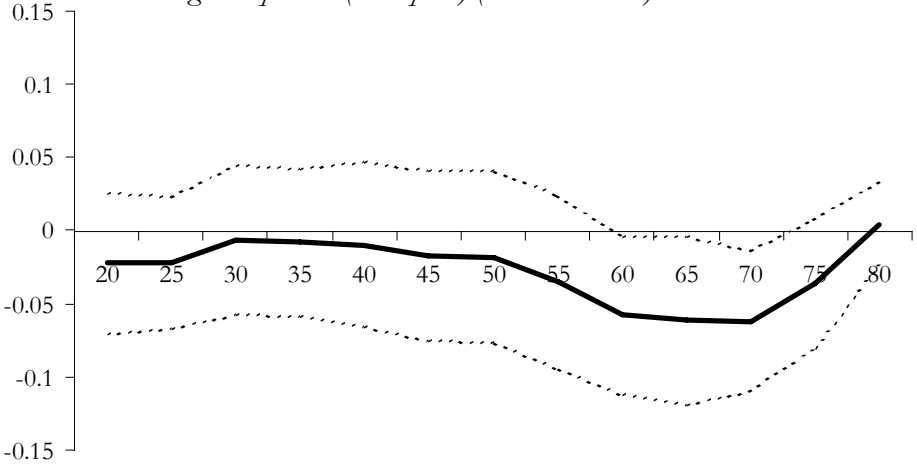


Figure 11fh: Incentive Effect

Coefficients from Quantile Regression on Ln(Days Away from Work)
Excluding dorsopathies (back pain) (ICD 720-724)



Notes: The middle line represents the coefficients obtained by quantile regression for the variables POST1*TREAT and POST2*TREAT. The outer lines bound the 90 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, POST2, diagnosis effects, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation. I also include Log(Weekly Benefit) and Log(Weekly Earnings).

Table 1: Sample Creation

1. Lost time claims	339,483
2. Exclude death and permanent total disability claims	335,962
3. Claimant received Temporary Total Disability Benefits	206,612
4. Exclude claims with bad return to work information	206,496
5. Injury has pre period observations in at least 2 pre period quarters	204,755
6. Pre period trend is within common support	203,928
7. Claim has employer info	201,374
8. Claim has demographic information	191,962
9. Claim has industry and occupation	190,379
10. Pre period trend between -0.1 and 0.1	173,129
11. 3-Digit Diagnosis code x Treatment Dummy has at least 50 obs.	172,567
Pre period, treatment group	44,514
First post period, treatment group	38,092
Second post period, treatment group	79,081
Pre period, comparison group	3,199
First post period, comparison group	2,607
Second post period, comparison group	5,074

Table 2: Share of Sample that is Right-Censored

	Treatment Group	**Comparison Group**
Random Censoring		
Pre Period	0.079	0.065
Post Period One	0.049	0.041
Post Period Two	0.077	0.046
Imposed Interval Censoring (Truncate Spells at 2 Years)		
Pre Period	0.186	0.090
Post Period One	0.154	0.066
Post Period Two	0.152	0.066

Table 3: Pre-Period Demographic and Employer Characteristics

	Treatment Group	Comparison Group	T-statistic
Demographic Characteristics			
Male	0.689	0.655	-4.01
Age	37.251	37.593	1.63
	(11.384)	(12.191)	
Married	0.548	0.526	-2.41
Benefit and Wage Characteristics			
Ln(Weekly Benefit)	5.567	5.540	-3.06
	(0.002)	(0.008)	
Ln(Pre-Injury Weekly Earnings)	5.667	5.607	-2.41
	(0.006)	(0.025)	
Replacement Rate	0.689	0.655	-4.01
	(0.002)	(0.008)	
Industry			
Agriculture	0.018	0.017	-0.17
Construction	0.151	0.138	-1.84
FIRE	0.019	0.018	-0.55
Mining	0.004	0.003	-1.23
Retail	0.116	0.105	-1.9
Service	0.198	0.196	-0.23
Transportation	0.066	0.069	0.6
Wholesale	0.079	0.071	-1.57
Manufacturing	0.350	0.383	3.77
Occupation			
Farmer	0.011	0.010	0.68
Manager	0.029	0.024	0.91
Production Worker	0.434	0.466	3.58
Support	0.071	0.064	-1.59
Services	0.244	0.253	-0.08
Laborer	0.212	0.193	-2.59
Employer Experience Rating Characteristics			
Base	0.137	0.141	0.63
Group	0.367	0.352	-1.76
Experience Rated	0.441	0.445	0.44
Experience Rate	0.906	0.910	0.5
	(0.495)	(0.490)	
N	44,514	3,199	

Table 4: Pre-Period Injury Composition

	Treatment Group	Comparison Group	T-Statistic
Sprain, not specified	0.000	0.083	63.41
Head injury	0.046	0.143	24.21
Contusion to the head	0.005	0.000	-4.06
Eye injury	0.002	0.000	-2.55
Fractured back or neck	0.007	0.053	26.02
Sprained back or neck	0.284	0.163	-14.83
Burn on the arm	0.010	0.000	-5.6
Dislocated arm	0.002	0.000	-2.55
Fractured arm	0.053	0.162	25.15
Cut on the arm	0.005	0.021	11.08
Sprained arm	0.075	0.041	-7.11
Amputated hand	0.022	0.000	-8.57
Cut on the hand	0.054	0.000	-13.57
Burn on the leg	0.008	0.000	-4.97
Bruise on the leg	0.025	0.058	11.25
Dislocated leg	0.046	0.000	-12.41
Fractured leg	0.037	0.076	2.6
Cut on the leg	0.006	0.000	-4.43
Other	0.287	0.200	-10.57
N	44,514	3,199	

Table 5: Factors Impacting the Probability of Cash Benefit Receipt

	OLS	Probit	OLS	OLS	Probit	Probit
	(1)	(2)	(3)	(4)	(5)	(6)
WC MCO Effect	0.000	0.002	0.001	0.002	0.003	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Incentive Effect	0.002	0.009	0.006	0.006	0.012	0.012
	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)	(0.009)
N	1,524,213	1,524,213	1,348,292	1,348,292	1,348,292	1,348,292
R^2, Pseudo R^2	0.263	0.241	0.268	0.276	0.243	0.254

Each column includes indicators for POST1, POST2, year dummy variables and fixed effects for three digit ICD-9 code crossed with a treatment group indicator.
In each column, standard errors are clustered by three digit ICD-9 code crossed with a treatment group indicator.
Results in columns 1 and 2 are computed before sample restrictions are made to eliminate observations without employer or demographic information. This is why the sample size is larger in columns 1 and 2.
In columns, 2, 5, and 6, I present marginal effects from the probit.
Columns 4 and 6 also contain controls for demographic and employer characteristics.

Table 6: Factors Impacting Ln(Days Away from Work), Censored Regression

	Baseline	Baseline + Demographic Characteristics	Baseline + Employer Characteristics	Baseline + Industry, Occupation	Baseline + Ln(Benefit), Ln(Earnings)	Baseline + All Covariates
	(1)	(2)	(3)	(4)	(5)	(6)
WC MCO Effect	0.021	0.019	0.019	0.024	0.020	0.019
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
Incentive Effect	-.075**	-.079**	-.076**	-.074**	-.076**	-.079**
	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
N	172,567	172,567	172,567	172,567	172,567	172,567
Pseudo-R^2	0.057	0.058	0.057	0.057	0.057	0.059

Notes: Each specification includes year effects; controls for POST1 and POST2; the interaction terms POST1*TREAT and POST2*TREAT; and fixed effects for three digit ICD-9 codes crossed with a treatment group indicator. The "WC MCO Effect" is the coefficient on POST1*TREAT and the "Incentive Effect" is the coefficient on POST2*TREAT. I also add in the following covariates : Demographic (Male, Age, Married); Employer Characteristics (Experience Rating and Method of Rating); 1-Digit Industry (Agriculture, Construction, FIRE, Mining, Retail, Service, Transportation, and Wholesale—the left out category is Manufacturing); 1-Digit Occupation (Manager, Production Worker, Supervisor, and Service—the left out category is Laborer); and the Replacement Rate (Ln(Pre-Injury Weekly Earnings) and Ln(Weekly Benefit)).

Table 7: Factors Impacting Ln(Days Away from Work)
Censored Regression, Sample with Pre Period Employer Size Categories

	No Employer Size Categories	With Employer Size Categories
	(1)	(2)
WC MCO Effect	0.021	0.021
	(0.043)	(0.043)
Incentive Effect	-0.084**	-0.083**
	(0.038)	(0.038)
N	157,566	157,566
Pseudo-R^2	0.060	0.060

Notes: Each specification includes year effects; controls for POST1 and POST2; the interaction terms POST1*TREAT and POST2*TREAT; and fixed effects for three digit ICD-9 codes crossed with a treatment group indicator. The "WC MCO Effect" is the coefficient on POST1*TREAT and the "Incentive Effect" is the coefficient on POST2*TREAT. I also add in the following covariates : Demographic (Male, Age, Married); Employer Characteristics (Experience Rating and Method of Rating); 1-Digit Industry (Agriculture, Construction, FIRE, Mining, Retail, Service, Transportation, and Wholesale—the left out category is Manufacturing); and 1-Digit Occupation (Manager, Production Worker, Supervisor, and Service—the left out category is Laborer).

Table 8: Factors Impacting Ln(Days Away from Work), Censored Regression

	(1)	(2)	(3)	(4)
WC MCO Effect	0.031	0.052	0.036	0.042
	(0.045)	(0.047)	(0.044)	(0.045)
Incentive Effect	-.075*	-.067*	-0.013	-.063*
	(0.039)	(0.040)	(0.037)	(0.038)
N	169,687	159,826	145,494	162,539
Pseudo-R2	0.057	0.055	0.042	0.058

In column 1 I drop ICD 727 and ICD 881; in column 2 I exclude head injuries fractured backs or necks, and cuts on the arm; in column 3 I exclude all diseases of the muscoloskeletal system (ICD 710-739); and in column 4 just exclude dorsopathies (back pain) (ICD 720-724).

Notes: Each specification includes year effects; controls for POST1 and POST2; the interaction terms POST1*TREAT and POST2*TREAT; and fixed effects for three digit ICD-9 codes crossed with a treatment group indicator. The "WC MCO Effect" is the coefficient on POST1*TREAT and the "Incentive Effect" is the coefficient on POST2*TREAT.

Appendix A: Results for the Sample of Three Digit ICD-9 Diagnosis Codes which Contain both Treatment and Comparison Group Claims

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Table A1: Factors Impacting Ln(Days Away from Work)

Censored Regression	
WC MCO Effect	0.050
	(0.055)
Incentive Effect	-0.082
	(0.047)
N	89,546
Pseudo-R^2	0.049

This is the sample of three digit diagnosis codes which have both treatment and control group injuries. This regression also includes indicators for POST1, POST2, year dummies, and employer and demographic characteristics.

Figure A1: WC MCO Effect
Coefficient from Quantile Regression on Ln(Days Away from Work)

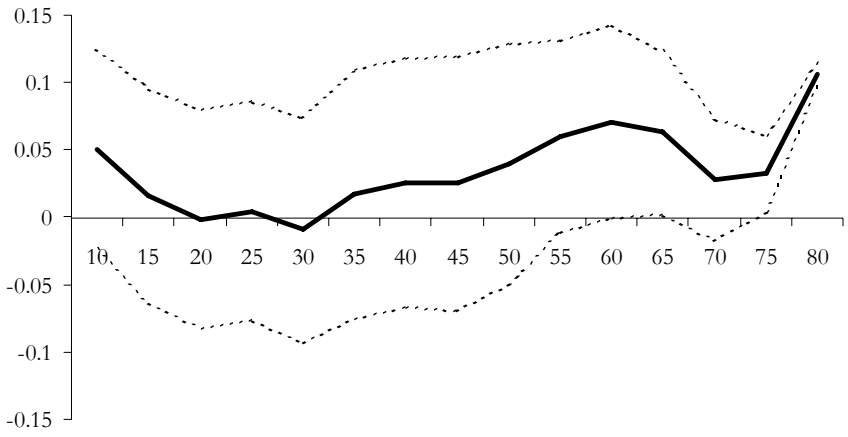
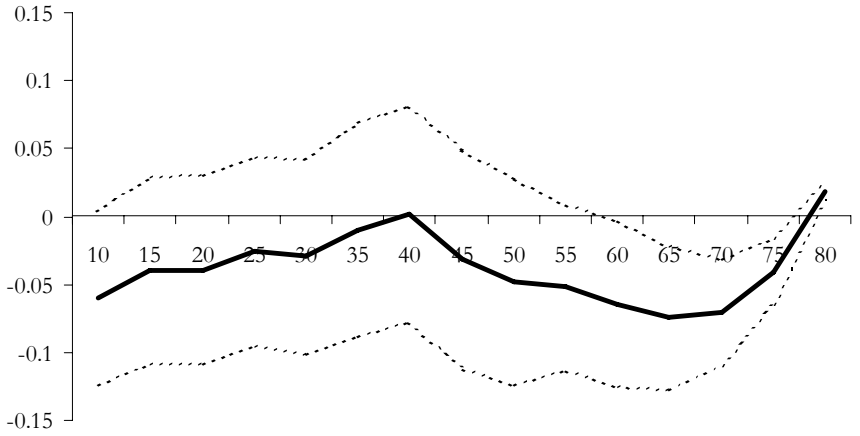


Figure A2: Incentive Effect
Coefficient from Quantile Regression on Ln(Days Away from Work)



Notes: The middle line represents the coefficients obtained by quantile regression for the variables POST1*TREAT and POST2*TREAT. The outer lines bound the 90 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, POST2, diagnosis effects, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation.

Appendix B: Factors Impacting Days Away from Work

Preliminary and Incomplete
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Table B1: Factors Impacting Days Away from Work Censored Regression

	(1)	(2)
WC MCO Effect	0.981	-34.914
	(7.573)	(20.420)
Incentive Effect	-7.718	-64.333
	(6.498)	(17.537)
N	172,567	172,567
Pseudo-R^2	0.016	0.006

The dependent variable in column 1 is days away from work, truncated at two years for all workers. The dependent variable in column 2 is days away from work with random censoring; the last observed return to work date is 12/31/2005 for all workers. I also controls for POST1 and POST2; the interaction terms POST1*TREAT and POST2*TREAT; and fixed effects for three digit ICD-9 codes crossed with a treatment group indicator. The "WC MCO Effect" is the coefficient on POST1*TREAT and the "Incentive Effect" is the coefficient on POST2*TREAT. I also add in the following covariates : Demographic (Male, Age, Married); Employer Characteristics (Experience Rating and Method of Rating); 1-Digit Industry (Agriculture, Construction, FIRE, Mining, Retail, Service, Transportation, and Wholesale—the left out category is Manufacturing); and 1-Digit Occupation (Manager, Production Worker, Supervisor, and Service—the left out category is Laborer).

Figure B1: WC MCO Effect

Coefficients from Quantile Regression for Days Away from Work
All spells truncated at two years

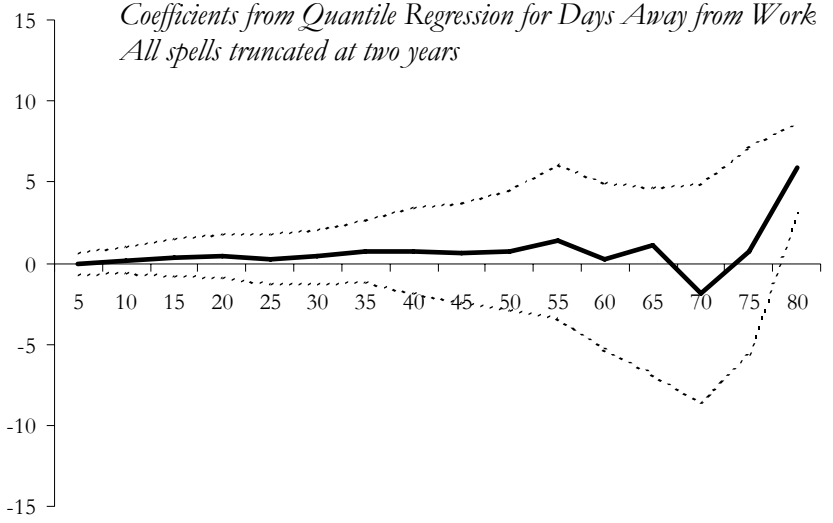
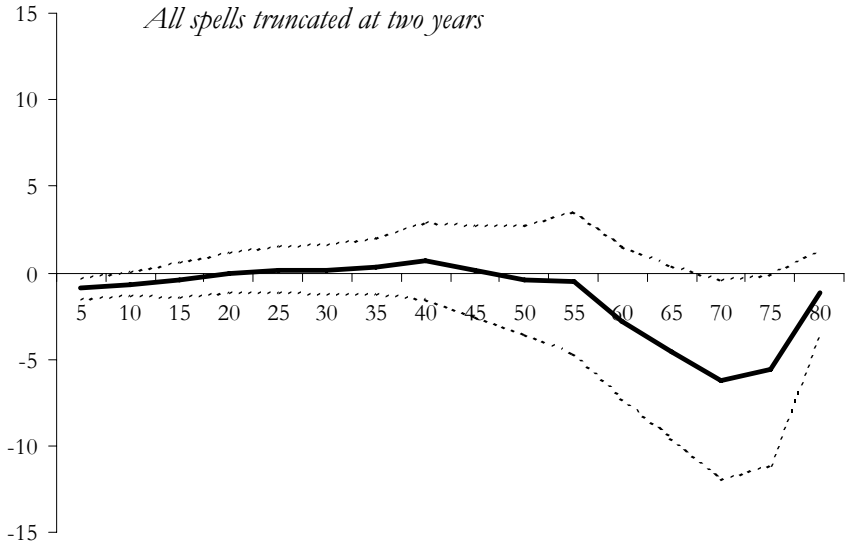


Figure B2: Incentive Effect

Coefficients from Quantile Regression for Days Away from Work
All spells truncated at two years



Notes: The middle line represents the coefficients obtained by quantile regression for the variables POST1*TREAT and POST2*TREAT. The outer lines bound the 90 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, POST2, diagnosis effects, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation.

Appendix C: Investigating the Upward Trend in the Right Hand Tail of the Quantile Regression Results

Results of the WC MCO Effect Only

Figure C1: WC MCO Effect

Sample of injuries occurring in PRE or POST1, all spells truncated at 2 years
Coefficients from Quantile Regression for Ln(Days Away from Work)

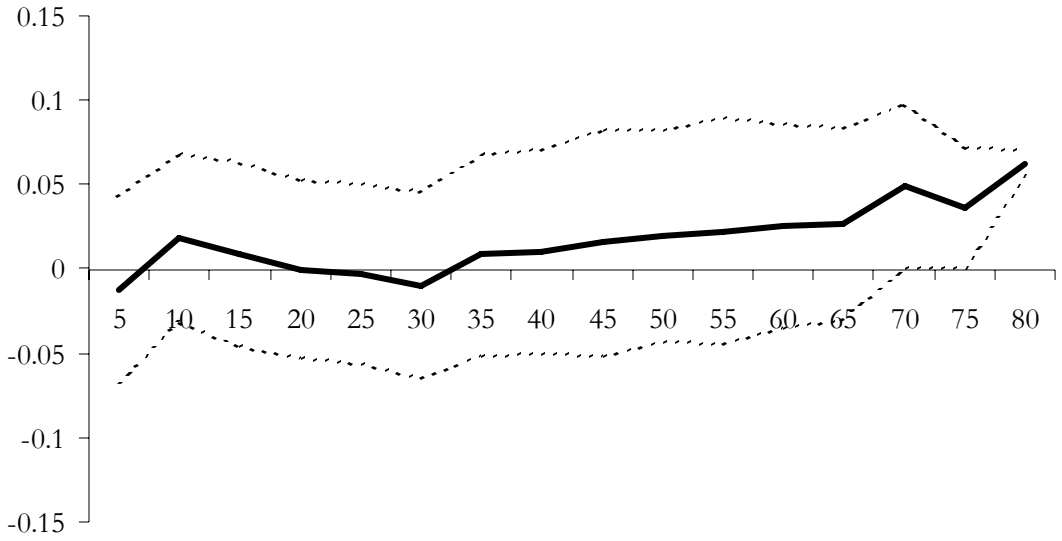
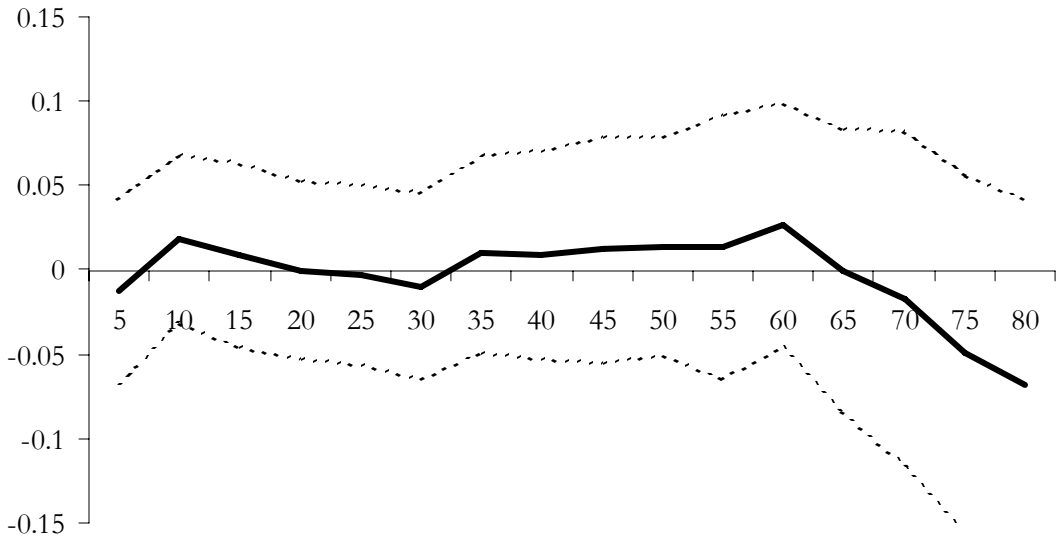


Figure C2: WC MCO Effect

Sample of injuries occurring in PRE or POST1, all spells truncated at 6 years and 9 months
Coefficients from Quantile Regression for Ln(Days Away from Work)



Notes: The middle line represents the coefficients obtained by quantile regression for the variable POST1*TREAT. The outer lines bound the 90 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, diagnosis effects, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation.

Appendix D: Results using 18 Injury Categories and not Diagnosis Code Fixed Effects

Table D1: Factors Impacting Ln(Days Away from Work), Censored Regression

WC MCO Effect	0.015
	(0.045)
Incentive Effect	-0.102
	(0.038)
N	172,567
Pseudo-R^2	0.030

Instead of controlling for injury using three-digit ICD-9 diagnosis codes crossed with treatment group indicators, I use 18 injury categories and include a separate control for the treatment group injuries.
This regression also includes indicators for POST1, POST2, year dummies, and demographic and employer characteristics.

Figure D1: WC MCO Effect
Controlling for injury using 18 injury categories and a treatment group indicator
Coefficients from Quantile Regression on Ln(Days Away from Work)

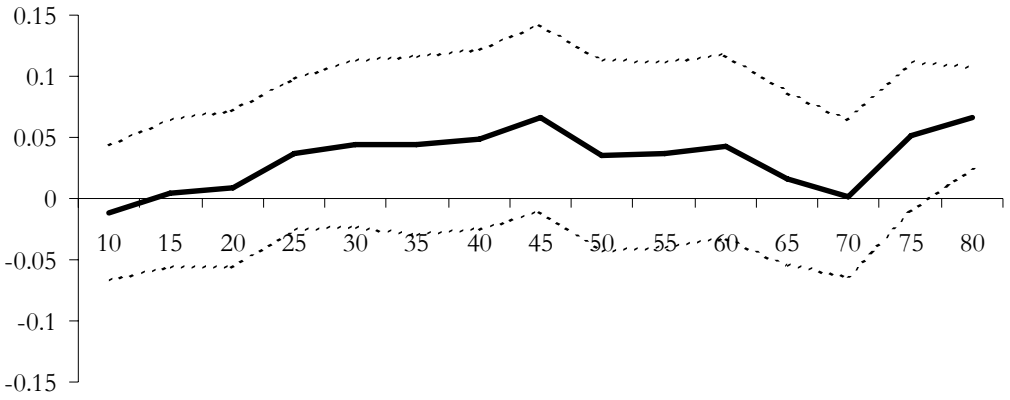
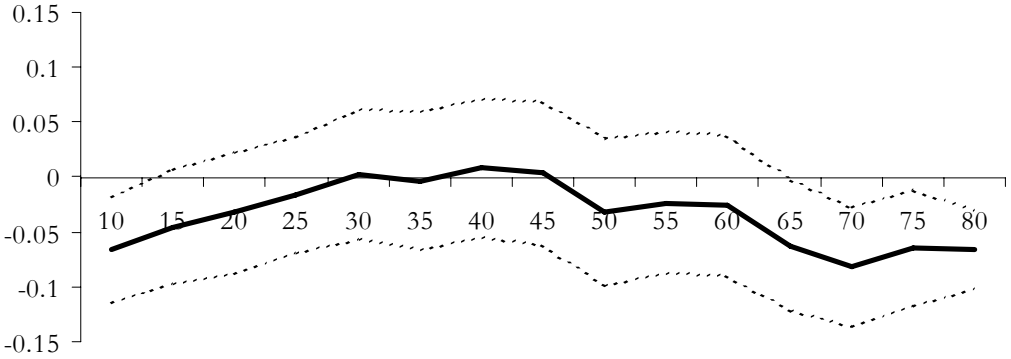


Figure D2: Incentive Effect
Controlling for injury using 18 injury categories and a treatment group indicator
Coefficients from Quantile Regression on Ln(Days Away from Work)



Notes: The middle line represents the coefficients obtained by quantile regression for the variables POST1*TREAT and POST2*TREAT. The outer lines bound the 90 percent confidence interval for these coefficients. Each regression also includes indicators for POST1, POST2, diagnosis effects, demographic characteristics, employer characteristics, 1-digit industry, and 1-digit occupation.

Appendix E: Investigating the Threat of Re-Labeling

Incentive Share Over Time for Different Injury Classifications

Table E1: Incentive Share Over Time by 3-Digit ICD-9 Code

3-Digit ICD-9 Code	Pre	Mid	Post	N Pre Period
337	0.000	0.000	0.000	21
354	1.000	1.000	1.000	2,477
550	1.000	1.000	1.000	1,747
552	0.000	0.000	0.000	22
553	0.000	0.000	0.000	59
604	0.000	0.000	0.000	15
681	1.000	1.000	1.000	65
682	0.442	0.561	0.439	113
692	0.000	0.000	0.000	83
715	0.000	0.000	0.000	4
717	1.000	1.000	1.000	285
718	0.000	0.000	0.000	12
722	0.993	0.988	0.989	3,593
723	0.000	0.000	0.000	8
724	1.000	1.000	1.000	247
726	0.961	0.966	0.985	1,797
727	***0.470***	***0.544***	***0.655***	***640***
728	0.000	0.000	0.000	8
802	0.000	0.000	0.000	41
805	1.000	1.000	1.000	248
807	0.000	0.000	0.000	169
808	1.000	1.000	1.000	44
810	1.000	1.000	1.000	23
811	1.000	1.000	1.000	14
812	1.000	1.000	1.000	49
813	0.142	0.215	0.169	605
814	1.000	1.000	1.000	99
815	1.000	1.000	1.000	337
816	1.000	1.000	1.000	1,760
820	1.000	1.000	1.000	21
821	1.000	1.000	1.000	56
822	1.000	1.000	1.000	195
823	0.779	0.734	0.789	307
824	0.768	0.735	0.778	751

(Table E1 continued on next page)

(Table E1 continued from previous page)

3-Digit ICD-9 Code	Pre	Mid	Post	N Pre Period
825	1.000	1.000	1.000	1,182
826	1.000	1.000	1.000	577
831	1.000	1.000	1.000	74
833	1.000	1.000	1.000	16
834	0.000	0.000	0.000	5
836	1.000	1.000	1.000	2,045
840	0.952	0.966	0.958	2,194
841	1.000	1.000	1.000	221
842	0.975	0.983	0.986	1,057
843	1.000	1.000	1.000	149
844	0.952	0.951	0.952	1,635
845	1.000	1.000	1.000	1,534
846	1.000	1.000	1.000	4,438
847	0.940	0.941	0.944	8,705
848	0.000	0.000	0.000	265
850	0.000	0.000	0.000	42
871	0.000	0.000	0.000	10
873	0.000	0.000	0.000	4
880	1.000	1.000	1.000	24
881	***0.752***	***0.612***	***0.658***	***270***
882	1.000	1.000	1.000	386
883	1.000	1.000	1.000	2,036
885	1.000	1.000	1.000	141
886	1.000	1.000	1.000	858
891	1.000	1.000	1.000	205
892	1.000	1.000	1.000	35
893	1.000	1.000	1.000	31
916	0.000	0.000	0.000	7
918	1.000	1.000	1.000	71
920	1.000	1.000	1.000	228
921	1.000	1.000	1.000	11
922	0.000	0.000	0.000	53
923	0.918	0.901	0.937	753
924	0.856	0.872	0.856	1,299
927	0.947	0.938	0.954	189
928	0.896	0.922	0.873	144
930	1.000	1.000	1.000	19
940	1.000	1.000	1.000	14
941	1.000	1.000	1.000	50
942	1.000	1.000	1.000	7
943	1.000	1.000	1.000	125
944	1.000	1.000	1.000	307
945	1.000	1.000	1.000	341
987	0.000	0.000	0.000	21
994	0.000	0.000	0.000	20
Total				47,713

Table E2: Incentive Share Over Time by 18 Injury Classifications

Injury Classifications	Pre	Mid	Post	N Pre Period
Sprain, not specified	0.000	0.000	0.000	265
Head injury	***0.815***	***0.860***	***0.916***	***2,487***
Contusion to the head	1.000	1.000	1.000	228
Eye injury	1.000	1.000	1.000	90
Fractured back or neck	***0.633***	***0.649***	***0.684***	***461***
Sprained back or neck	0.960	0.960	0.961	13,143
Burn on the arm	1.000	1.000	1.000	432
Dislocated arm	1.000	1.000	1.000	90
Fractured arm	0.820	0.841	0.809	2,887
Cut on the arm	***0.772***	***0.657***	***0.690***	***294***
Sprained arm	0.962	0.943	0.968	3,472
Amputated hand	1.000	1.000	1.000	999
Cut on the hand	1.000	1.000	1.000	2,422
Burn on the leg	1.000	1.000	1.000	341
Bruise on the leg	0.856	0.872	0.856	1,299
Dislocated leg	1.000	1.000	1.000	2,045
Fractured leg	0.922	0.908	0.917	3,089
Cut on the leg	1.000	1.000	1.000	271
Other	0.952	0.954	0.957	13,398
Total				47,713

Table E3a: Incentive Share Over Time by Broad Injury Category

	Pre	Mid	Post	N Pre Period
Diseases of the Nervous System and Sense Organs	0.992	0.992	0.994	2,498
Diseases of the Digestive System	0.956	0.955	0.951	1,828
Diseases of the Genitourinary Tract	0.000	0.000	0.000	15
Diseases of the Skin and Subcutaneous Tissue	0.441	0.510	0.469	261
Diseases of the Muscoloskeletal System	0.929	0.944	0.964	6,594
Injury and Poisoning	0.932	0.963	0.934	36,517
Total				47,713

Table E3b: Incentive Share Over Time for Diseases of the Muscoloskeletal System

	Pre	Mid	Post	N Pre Period
Arthropathies and Related Disorders	0.947	0.964	0.966	301
Dorsopathies	0.991	0.988	0.989	3,848
Rheumatism, Excluding the Back	0.829	0.870	0.923	2,445
Total				6,594